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A DICTIONARY
OF
ARCHITECTURE AND BUILDING

VOLUME I

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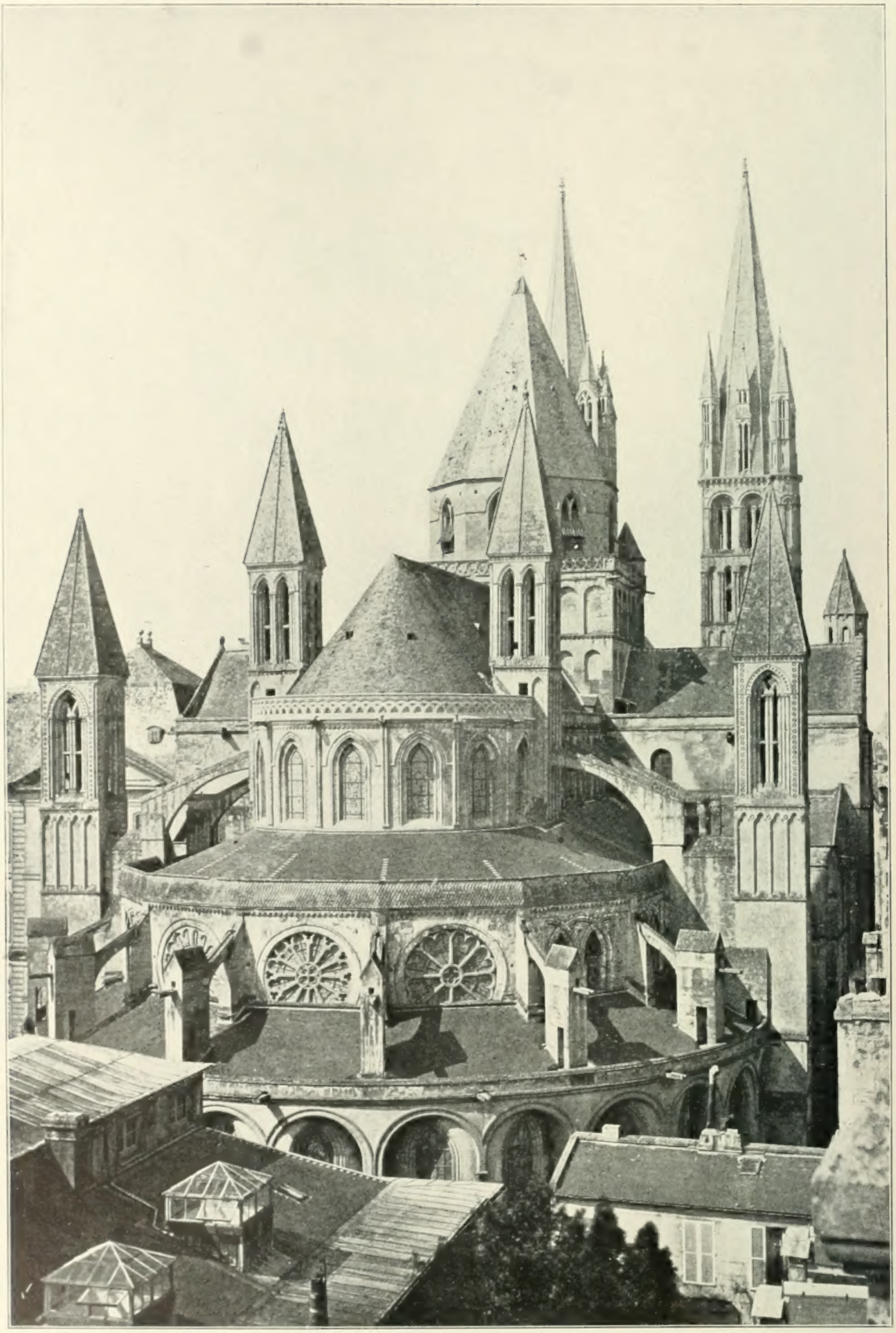

ABBAYE AUX HOMMES

The church of S. Étienne (S. Stephen) at Caen, in Normandy. Its popular name signifies that it was the church of a religious community of men, as distinguished from the Abbaye aux Dames, which was the church of a nunnery. The building was begun about 1065; the western towers (in the background of this plate) being ten years later, and the pinnacles, together with the system of flying buttresses and the tracery of the western windows, as well as the pointed windows in their present condition, all being of the next century. The central tower represents a much more lofty one which was destroyed during the religious wars.

A DICTIONARY

OF

ARCHITECTURE AND BUILDING

Biographical, Historical, and Descriptive

BY

RUSSELL STURGIS, A.M., PH.D.

FELLOW OF THE AMERICAN INSTITUTE OF ARCHITECTS

AND MANY

ARCHITECTS, PAINTERS, ENGINEERS, AND OTHER EXPERT
WRITERS, AMERICAN AND FOREIGN

IN THREE VOLUMES

VOL. I

A — E

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The Author of Law, — to Mr. Philip Golden Bartlett.

The Author of Music Hall, — to Mr. Theodore Thomas.

The Author of Surveying, — to Mr. Edward B. Sturgis.

C. D. = Century Dictionary.
N. E. D. = New English Dictionary, now in course of publication; Oxford.
A. P. S. = Architectural Publication Society, *i.e.* the Dictionary of Architecture published by that Society.

PREFACE TO THE DICTIONARY OF ARCHITECTURE

THERE is apparently no dictionary of architecture in English except the work in eight volumes, small folio, begun about 1850 and finished ten years ago: the work of a Society organized for the purpose of this publication. Apart from this there are only glossaries, and those avowedly partial and limited in character.

Even in seeking such aid as a dictionary in a foreign language can give him, the student is compelled to use two or even three different works, together and in conjunction, since no one book presents the subject fairly complete under one alphabet. It is this comment also which is to be made upon the few attempts toward a cyclopædia of the building arts as such. Such cyclopædias, whether special or general in character, have never possessed that essential feature of a dictionary, the alphabetical arrangement carried into detail. Alphabetical arrangement where it exists is limited to the mere displaying in that order of a limited number of separate essays. Cyclopædias of this character have little to differentiate them from a series of separate volumes. Neither the cyclopædia nor the collection of volumes is likely to have a full alphabetical index; and without it the work in question does not fulfil that requirement of the dictionary which is its first and most essential one.

This requirement is fitness for ready consultation. In order to meet this requirement two separate features must be combined, alphabetical arrangement carried to minute subdivision, and cross references in abundance. In a glossary, that is, a list of words with their apparent meanings briefly stated, no cross references are needed other than the occasional definition of one term as the "same as" that of another. As soon, however, as the definitions grow into explanation, and these explanatory definitions into essays or descriptions, which exceed in length three or four score words each, it becomes evident that much matter given under one caption may be very useful indeed if found in connection with another caption in another part of the work. Therefore, to avoid the obviously impracticable repetition of the substance of whole paragraphs, there suggests itself an elaborate system of references, backward and forward. By the use of these references the student may, at his pleasure, enlarge the description or the discussion before him by consulting two or three or perhaps a dozen articles. The possibility of such reference from one article to another may be increased indefinitely by the insertion of articles serving primarily as indices to other articles in the same work. Thus in the book now presented the article Aboriginal American Architecture refers to a great number of terms under which treatment of that general subject will be found; under Columnar Architecture will be found a list of terms in common use, each of which is defined in its alphabetical place, and by comparison of which the whole subject may be thought to be adequately presented. The value of this feature will be recognized by those persons who have ever thought how much we need a reversed dictionary, — a book which shall tell us the names of the things which we know of and cannot "put a name to." Thus, in the matter of Columnar Architecture, it is sometimes desirable to find out quickly the proper term for the colonnade of seven columns; but no dictionary, unless elaborated in the way above suggested, will do that. It will only tell you that heptastyle means having seven columns, which is a different thing.

The reader is advised, however, that in this dictionary the actual printed reference has been omitted whenever the term referred to is obviously one to be found in the dictionary. Thus, if, in defining Vault, the terms Arch, Arched, Groin, Voussoir, are used, the reader will naturally assume that these terms are given in their place in the dictionary, and that other kindred matter is to be found under these terms. He will not expect to inform himself thoroughly about vaults and vaulting without consulting the articles, or some of them, to be found under the technical terms used *passim* in the course of the articles under Vault and Vaulting. The terms not so obviously a part of the dictionary nor so obviously related to the question in hand will be found named in the special references.

It has been thought good to add to the vocabulary the names of such important buildings as can be said to have names of their own apart from geographic significance. Thus the Pantheon at Rome and the Panthéon at Paris are often mentioned in writing and in print without allusion to the places where they stand. So, Westminster Abbey, the Superga, and "the Church of Brou" are named currently in literature without any mention of London town, Turin, or Bourg-en-Bresse; and, although their very titles are geographic, are not to be found in a gazetteer. These and other similar proper names of important buildings have been added therefore to the already too large vocabulary; but the number of such titles is perforce very limited.

The sympathetic manner in which the contributors have aided in the making up of this dictionary cannot be spoken of in such terms as would rightly describe it. The object having been to procure each separate article of importance from a recognized expert in the special field has been attained in the mere fact of securing such contributors as those whose names are found in the pages following the title. The work of these men is generally to be found in signed articles, in which the reader may appreciate its freshness, its thoroughness, its originality of treatment, the novelty of its point of view. That is what comes of the work of men of profound — of generally practical and often lifelong — familiarity with their subjects. Some few names, however, must be specially mentioned here as those of persons whose work does not appear chiefly in long and notable articles over the writer's own name. Thus Mr. Van Brunt and Professor Hamlin have contributed the most largely to the great mass of briefer definitions; Mr. Dellenbaugh has furnished, in the matter of American antiquities, a somewhat complete essay cut up into short articles; Mr. Hutton has added to his longer papers a mass of engineering material in the form of definitions which it is impossible to overrate; Mr. Merrill has given to his brief accounts of different stones and marbles as scientific a treatment as to his larger contributions. All the biographies in the dictionary (except a very few signed R. S.) are the work of Mr. Edward R. Smith, and to him is to be ascribed not merely the writing of each separate notice, but also the choice, arrangement, and proportioning within the limits of subjects assigned to him. Mr. D. N. B. Sturgis has acted as assistant editor during the past eighteen months, and in the course of this long-continued service has contributed very much technical and semiscientific matter, especially in connection with the modern terms of the building trades.

The illustrations have been drawn from many sources, of which a complete list will be given at the close of the work. It is right, however, to mention here the names of those contributors who have, without additional remuneration, furnished illustrations to their own articles. These are, for Vol. I, Mr. Hill to the article Apartment House, Mr. Gerhard to the article Bath House and those following, Mr. Hutton to several minor articles, and Mr. Dellenbaugh to Casa Grande and Cliff Dwellings. Original diagrams have been provided for a number of articles.

R. S.

NOVEMBER, 1900.

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DICTIONARY OF ARCHITECTURE

A

AARON'S-ROD. An ornament consisting of a straight moulding of rounded section, with leafage or scroll work seeming to emerge from it.

ABACISCUS; ABACULUS. A single tile, slab, or tessera as used in mosaic and the like.

ABACUS. The uppermost member of a capital; a plain square slab in the Grecian Doric style, but in other styles often moulded or otherwise enriched. Egyptian and Asiatic capitals are often without the abacus.

ABADIE, PAUL, the Elder; architect; b. July 22, 1783, at Bordeaux, France; d. Dec. 3, 1868.

In 1805 he entered the atelier of Percier (see Percier), in Paris. In 1818 he was appointed architect of the city of Angoulême and the department of Charente. At Angoulême he built the palais de justice (1825), the hôtel of the prefecture (1828), the lycée, the grain market.

Gourlier, Biet, etc., *Choix d'édifices publics*, Bauchal, *Dictionnaire*.

ABADIE, PAUL, the Younger; architect; b. Nov. 9, 1812 at Paris; d. August 2, 1884.

A son of Paul Abadie the Elder (see Abadie). In 1835 he entered the École des Beaux Arts (Paris) under the direction of Achille Leclère (see Leclère). In 1848 he was made architect of the dioceses of Angoulême, Périgueux, and La Rochelle, and in 1861 *inspecteur général des édifices diocésains*. Abadie was interested in the restoration of many mediæval monuments, especially the Church of S. Front at Périgueux and the Cathedral of Angoulême. He built also the Hôtel de Ville at Angoulême. In 1874 he replaced Viollet-le-Duc (see Viollet-le-Duc), as architect of Notre Dame (Paris). He began the Church of the *Sacré Cœur* on Montmartre (Paris), but did not finish it.

Daumet, *Notice Biographique*.

ABATED. In stone cutting, hammered metal work, and the like, cut away or beaten down, lowered in any way, as the background of a piece of ornament, so as to show a pattern or figure in relief.

ABAT-JOUR. In French, anything which serves to throw daylight or other light downward, or in a given direction; from the movable shade of a lamp to the sloping soffit of a window.

ABAT-SONS. In French, anything intended to reflect sound, as of a bell, downward or horizontally. (See Belfry; Louver Board.)

ABATTOIR. In French, a Slaughter House (which see for special article); used in English for such an establishment when of an approved build and arrangement; a public slaughter house.

ABAT-VOIX. In French, a sounding board.

ABBADIA. Same as Badia.

ABBATE, NICCOLÒ DEL. (See Niccolò del Abbate).

ABBAYE AUX DAMES. The Church of the Trinity at Caen, in Normandy; once the church of a nunnery founded by the Duchess Matilda, wife of William the Conqueror. (See France, Architecture of.)

ABBAYE AUX HOMMES. The Church of S. Etienne at Caen, in Normandy; once the church of a monastery founded by the Duke William the Conqueror. (See France, Architecture of.)

ABBEY. *A.* A monastic establishment, governed by an abbot or abbess, and belonging to the highest rank of such institutions. (Compare Convent; Monastery; Monastic Architecture; Priory.)

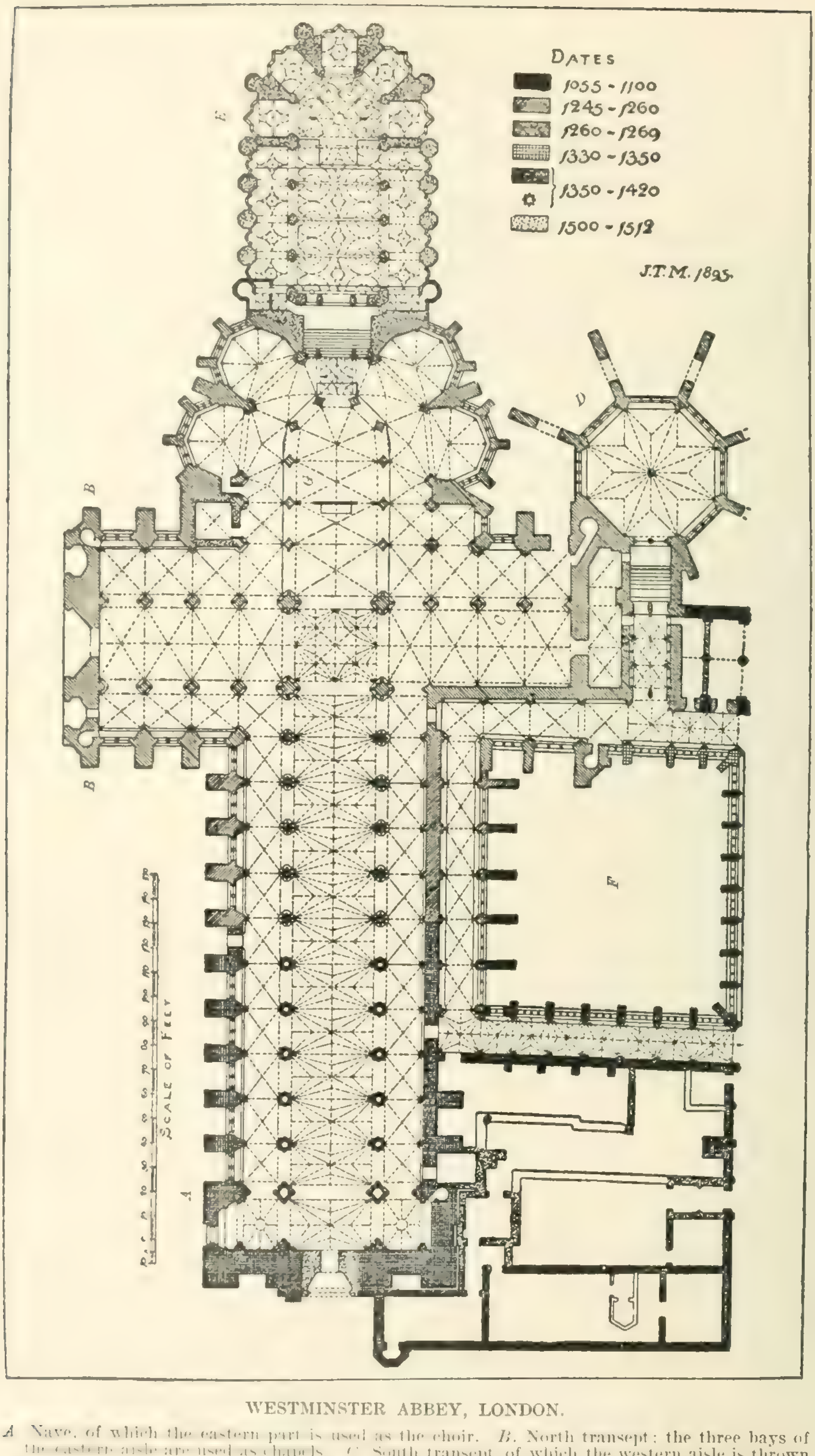
The buildings of a large abbey include, besides a church, a cloister, around which are ranged such buildings as the refectory, dormitory, storehouses, and cellars, lodgings for guests, and the abbot's lodging, which was generally a place of some importance and with many conveniences.

B. By extension, and erroneously, the same as Abbey Church (which see under Church); thus, Westminster Abbey is merely the church of what was once a large monastic establishment.

Bath Abbey. A late Gothic church at Bath, Somersetshire, England. It was begun at the close of the fifteenth century.

Battle Abbey. A ruined church in Sussex, England, near the little town of Battle, and commemorating, as does its name, the victory of William the Conqueror over Harold.

Westminster Abbey. More properly the Abbey Church of S. Peter, in London. This building is one of the most important Gothic buildings in England. The exterior has suffered from rebuilding and restoration, but the interior, the cloisters, chapter house, and other adjuncts are of remarkable beauty. At the extreme eastern end is Henry the Seventh's Chapel (which see under Chapel). The Abbey contains a great number of funeral monuments of celebrated persons. (Cut, cols. 3, 4.)



WESTMINSTER ABBEY, LONDON.

A. Nave, of which the eastern part is used as the choir. *B.* North transept: the three bays of the eastern aisle are used as chapels. *C.* South transept, of which the western aisle is thrown into the cloister: the remainder is the "Poets' Corner." *D.* Chapter house. *E.* Henry the Seventh's Chapel. *F.* Cloister. *G.* Edward the Confessor's Chapel.

ABBEY CHURCH. (See under Church.)

ABBEY OF S. GEORGE. *Abbaye de S. Georges de Boscherville* is in the little village of Saint Martin de Boscherville (Seine Inférieure) in Normandy. The two names of saints often cause confusion. The abbey church has suffered little, and the chapter house preserves much ancient work. The whole is important in the history of Romanesque architecture.

ABBEYS OF SCOTLAND. Valuable in some cases as a study of the earliest northern round arched work, and in other cases for their transitional architecture. (Compare Abbeys of Yorkshire.) The principal ones are Iona, Dunfermline, Holyrood (now enclosed in the city of Edinburgh), Jedburgh, Kelso, Melrose, Dryburgh, Arbroath, Pluscarden, Crosraguel, Glenluce, and Lincluden; but there are several others of which the remains are but slight. In these, as in the abbeys of Yorkshire, there has been very little truly archæological investigation, and almost nothing has been done in the way of digging to ascertain the original plans of the old structure.

See *Scotland's Ruined Abbeys*, by H. C. Butler, New York, 1899, and *Castellated and Domestic Architecture of Scotland*, by MacGibbon and Ross, Edinburgh, 1887–1892.

ABBEYS OF YORKSHIRE. In England; mainly in ruins, but most interesting as a study of the transitional art of England. The principal ones are Whitby (Benedictine), Byland, Rievaulx, Fountains, Jervaulx, Kirkstall, and Sawley (all Cistercian), Bolton (Augustinian); but there are several others, for which see Murray's *Handbook to Yorkshire* (Introduction, and under the separate geographical terms) and books on English Romanesque and English Gothic.

ABBONDI, ANTONIO (called lo Scarpagnino); architect; d. 1549.

Scarpagnino was *proto* or chief architect of the *Proveditori del Sale* in Venice. Oct. 13, 1505, he was appointed superintendent of the reconstruction of the Fondaco dei Tedeschi, (Venice), from the model of Girolamo Tedesco, (see Tedesco), which was finished in 1508. In 1506 his name appears in the records of S. Sebastiano (Venice), of which church he is supposed to have been the supervising architect. Jan. 10, 1514, many buildings of the Rialto quarter in Venice were destroyed by fire. March 2 of the same year Alessandro Leopardi (see Leopardi), Giovanni Celeste, Fra Giovanni Giocondo (see Giocondo), and other architects were called before the Doge and Signoria to make proposals for reconstruction. May 22 three models were presented, and July 18 four models, of which one was by Giocondo and another by Leopardi. A third was presented by Abbondi on behalf of the *Proveditori del Sale*. This last was selected Aug. 26, 1514. The work of reconstruction was finished about 1522. The buildings then made are called the *Fabbriche Antiche* in distinction from the *Fabbriche Nuove*, added later by Jacopo Sansovino (see Sansovino, Jacopo). This reconstruction included the Church of S. Giovanni Elemosinario. In 1520 with Francesco Lurano he finished the Ponte della Pietra at Verona. Oct. 6, 1527, Abbondi succeeded Santo Lombardo as *protomaestro* of the Scuola di San Rocco. He built the upper story of the main façade, one of the finest in Venice. His name occurs in the accounts of the Doge's palace, but not in a prominent way. His will is dated July 28, 1548.

Paoletti, *Rinascimento in Venezia*, Vol. II., p. 282; Temanza, *Vite dei piu celebri Architetti e Scultori Veneziani.*

ABEL, JOHN; architect; b. 1577; d. 1674.

Abel was a famous builder of timber edifices in England. He built the town halls of Hereford (destroyed 1861), and Leominster (destroyed 1858) which are illustrated in Clayton's *Ancient Timber Edifices of England*, folio, 1846.

Price, *Historical Account of Leominster*; Price, *Historical Account of Hereford.*

ABORIGINAL AMERICAN ARCHITECTURE. (See United States, Architecture of, Part I.; also, Adobe; Altar Mound; Assembly House; Aztec Architecture; Barracoa; Cakchiquel Architecture; Calli; Casa Grande; Casas Grandes; Cavate Lodge; Cave Dwelling; Central America, Architecture of; Cerro; Chultune; Cliff Dwelling; Cliff Outlook; Communal Dwelling; Communal Lodge; Corbel Arch; Council House; Dancing Lodge; Dead House (II.); Dirt Lodge; Dobie; Dugout; Earth Lodge; Eskimo Architecture; Estufa; Ghost Lodge; Grass House; Greenland, Architecture of; Hill Fort; Iglu; Iglugeak; Inca Architecture; Indian Architecture; Jacal; Kiva; Latchash; Lodge; Log House; Long House; Maya Arch; Maya Architecture; Medicine Lodge; Mesa Dwelling; Mesa Village; Mexican Architecture; Mexico, Architecture of; Mystery Lodge; Nahuatl Architecture; Peru, Architecture of; Pirca; Pueblo; Snow House; Sod House; Step Log; Stinash; Sudatory; Sun Pole; Sweat Lodge; Temascale; Teocalli; Tipi; Toltec Architecture; Village, American Indian; Wickyup; Wigwam; Yucatan, Architecture of; Zahcab; Zunian.)

ABREUVOIR. In French, a tank or trough specially for the watering of animals; hardly used in English except for elaborate architectural compositions.

ABUT (v. i.). To touch, or join, by its end; as, in a timber where the end grain is planted against another member of a structure, but without framing; or where an arch bears upon a pier, course of stone, skew back, or the like. (Compare Abutment and Butt (v.) and (n.)).

ABUTMENT. A surface or structure on which a body abuts or presses. Specifically,

A. That [illegible] takes the weight and also the thrust of an arch, vault, or truss; usually that part of the wall or pier which may be supposed to be the special support of the construction above. In the case of a series of arches or trusses, the term usually applies to the comparatively heavy piers at the ends and not to the intermediate supports, unless very large. Hence, by extension, but incorrectly, the masonry or rock to which the cables of a suspension bridge are anchored.

B. In carpentry, the joining of two pieces so that their grain is perpendicular, or nearly so. (See Abutting Joint, under Joint.)

ABUTTAL. A piece of ground which bounds on one side the lot or plot under consideration. Thus, the owner has to be careful not to encroach upon his abuttals by walls or substructures except by party wall agreement, or the like.

ABYSSINIA, ARCHITECTURE OF. This ancient kingdom has not been explored by those who could make architecture their study. No continued civilization has flourished there. Evidences of Greek and, perhaps, of Egyptian culture have been found, but these seem to be only the remains of monuments erected by conquering chiefs. Portuguese influence in the fifteenth and sixteenth centuries has left some trace, even an important bridge and an aqueduct; a great palace-fortress stands near Gondar which seems to be mediæval European in character; some buildings in modern European style have been designed and partly completed for recent sovereigns of the country; but it appears that no native style of building has reached any pitch of excellence in construction or in decoration which is needed to constitute an architecture. The round towers used as dwellings of the richer inhabitants of Gondar, the capital, are described as having the ground floor given up to cattle and as having one story above for the human inhabitants, with a conical roof thatched with reeds and grass. Some of the churches also are circular in plan, and with conical roofs, with an arrangement by which the clergy occupy a central compartment; other, and more modern, churches are square; and these are roofed by means of heavy timbers laid diagonally from side to side, enclosing each corner, so as to leave an open smaller square set diagonally with the square of the walls, or an open octagon, upon the curb or frame of which open space a square or octagonal cupola, lantern, or low tower of wood is set up. Except for this tower-like lantern, the square churches are flat-roofed: and many have nothing rising above the flat surface. All are small and low.

The houses of wealthy landholders in the country are surrounded by a high wall, the space within which is occupied by small huts for servants or temporary visitors. The house proper, *Aderasch* or "sitting room," is chiefly taken up by two large rooms on the ground floor, one used as a stable, the other, the men's room (compare Megaron), is roofed nearly as described above in the case of the square churches. A separate bedchamber (compare Bower; Thalamium) is sometimes partitioned off from the large room.

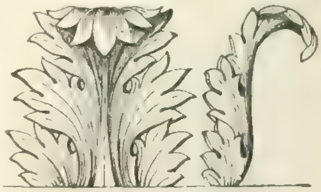
It is evident that curious systems and devices, both in building and in ornamentation, are discoverable in this large, mountainous, and diversified country, containing a very ancient, though never high, civilization. The subject still awaits the explorer and the student. — R. S.

ACADEMY OF ARCHITECTURE. *A.* An association of men considered as at the head of contemporary knowledge, judgment, and good taste in the matter of architecture; generally assumed to be a governmental institution or one recognized by the government and endowed with special privileges. It does not appear that any such institution is now in existence (compare Societies of Architects), but from 1671 to 1793, as stated by Larousse, there existed in France such an academy. It was confirmed by royal letters in 1717 and seems to have been so far independent and fearless that, in 1767, it was dissolved for protesting against an appointment. It was reconstituted almost immediately, and then consisted of twenty-three architects, sixteen honorary members or associates, and twelve foreign or corresponding members.

B. A school intended to prepare young men for the profession of architecture. (See Architect, The, in England, — France, — Italy.)

The Academy of France, at Rome, founded under Louis XIV. and still maintained by the government, partakes of the characteristics of both *A.* and *B.* It occupies the well-known Villa Medici. Its chief mission is the training of the winners of the Great Prize of Rome in painting, sculpture, architecture, engraving, and music. — R. S.

ACANTHUS. *A.* A plant growing freely in the lands of the Mediterranean, having large leaves, deeply cleft; the sharp pointed leaves of some species strongly resembling those of the familiar field and roadside thistles, Carduus (or *Cnicus*, Gray) Lanceolatus, Virginianus, and others. The two species commonly described and figured, Acanthus mollis and A. spinosus, are very different in the character of the leaves.



ACANTHUS.
As modified in Roman work.

B. In Greek, Greco-Roman, Byzantine, Romanesque, and neoclassic architecture, a kind of decorative leafage, assumed to be studied, or to have been studied originally from the plant, *A.* A statement in Vitruvius (IV. Ch. I.) as to the origin of the Corinthian capital gave rise to the common belief as to this origin. Other leaves, as those of parsley, celery, ranunculus, and many root leaves of herbaceous plants, seem equally well fitted to have been the origin of one or another variety of this common motive of ornament; but it is customary to speak of the leafage of the Corinthian capital and its variants, of that in S. Sophia and the Syrian Greek churches, of the similar leafage of twelfth-century work in France, and of the modern imitations of these types, as acanthus leaves. — R. S.

Acanthus, Natural.
From drawing by John Ruskin.

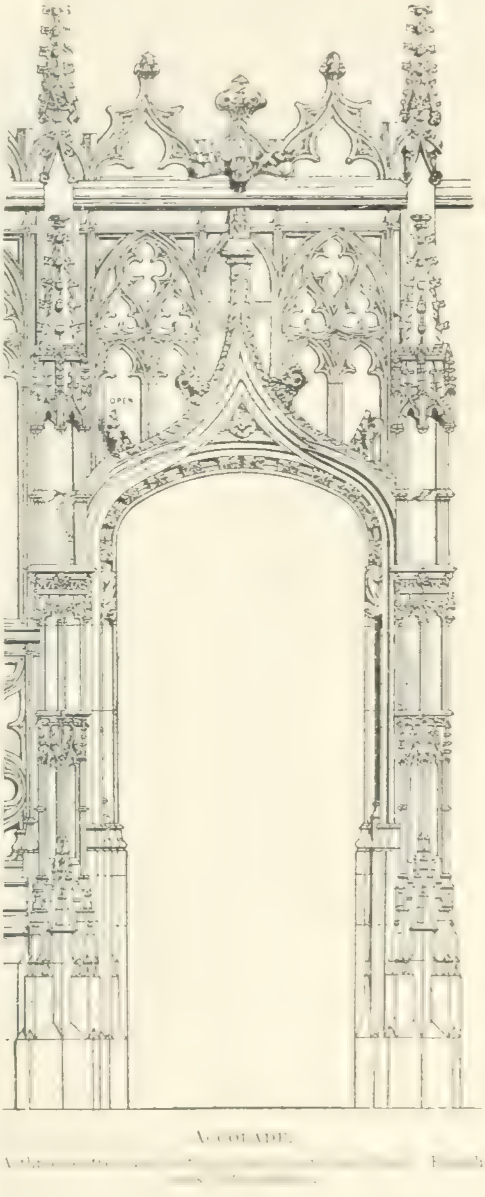
Acanthus, Natural.
From drawing by John Ruskin.

ACCADIAN ARCHITECTURE. The architecture of the Accads, a people inhabiting the country east of Syria in primitive times. (See Mesopotamia, Architecture of.)

ACCIDENTS, RESPONSIBILITY FOR. (See Liability for Accidents.)

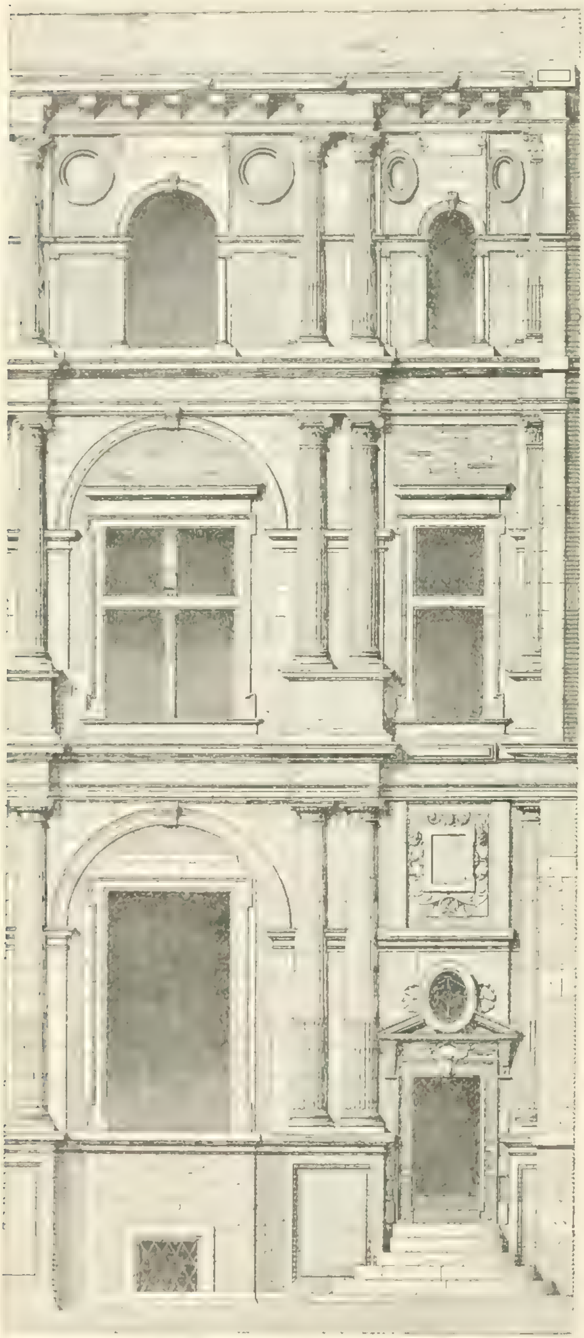
ACCOLADE. An ornamental treatment of the archivolt or hood moulding of an arch or of the mouldings of an apparent arch, or of a form resembling an arch, as in late Gothic work; consisting of a reverse curve tangent on either side to the curves of the arch, or its mouldings, and rising to a finial or other ornament above. (See Arch; Gothic Architecture.)

ACCOUPLEMENT. The placing of two columns or pilasters very close together. This device is common in neoclassic church fronts, and the like, and is most effective when several pairs of columns form together a colonnade, as in the celebrated example of the east front of the Louvre. It was almost unknown to Greek or Greco-Roman builders, so far as modern research enables us to say. In the revived classic styles it is considered essential that the capitals should not coalesce; but in mediæval work it



Accolade.
[illegible]

is common for them to form one block. The placing of a column closely in front of an anta or a pilaster is not considered accouplement.



Accouplement of Engaged Columns; Hotel d'Assezat, Toulouse, France.

(See Coupled Columns, under Column; Geminate; Grouped.) (Cut, cols. 13, 14.) — R. S.

ACHIEVEMENT. In heraldry, a complete display of armorial bearings; as, the escutcheon with its accompanying crest, motto or mottoes, and supporters, if any. (See Arms.) Also spelled atchievement.

ACOUSTICS. The physical science of sound, of its production, propagation, and effects, including the mechanics of audition. The term is often used in architectural writing to indicate that quality, or combination of qualities, of a hall that determines its value as an auditorium.

Sound is a longitudinal wave motion, communicated to the air or other surrounding media by a vibrating body, resulting in alternate condensations and rarefactions, which are generally progressive in space, but may be stationary. The combined condensation and rarefaction constitute a sound wave, and their combined thickness is called a wave length. The pitch of the sound is determined by the number of vibrations per second, the pitch rising as the frequency of vibration increases. In general, however, a sound is not a single pure note. When the complex sound comes from a single vibrating body the pitch of the predominant note is taken as that of the sound, and the other notes accompanying it are regarded as giving it a certain character, technically called quality. The loudness of the sound at any point, due to either progressive or stationary waves, depends upon the alteration of atmospheric pressure as rarefaction and condensation succeed each other. The velocity of propagation of sound is very nearly independent of the pitch, and at the ordinary temperature is about 1125 feet per second.

Reflection and Refraction. When a sound wave meets a surface separating the medium in which it is being propagated from another in which the velocity is different because the medium is different in either its elasticity or its density, the wave is divided into two parts, one of which is reflected and returned into the original medium, the other is refracted, entering the second medium with a more or less altered direction. The angles between the normal to the surface and the directions of propagation of the incident, the reflected, and the refracted waves are called the angles of incidence, reflection, and refraction respectively. The angle of reflection is equal to the angle of incidence. The sine of the angle of incidence divided by the sine of the angle of refraction is a constant, independent of the angle of incidence, and of the pitch of the sound. All these angles coincide in plane. These laws are similar to those for the reflection and refraction of light, and, as in the case of light, are applicable only when the reflecting surface is large and the minor irregularities of surface small in comparison with the wave length. The proportion of sound which is reflected is greater, and that which is refracted is therefore less, the greater the difference in elasticity or density between the two media, and the greater the angle of incidence.

Accouplement of Pilasters; Church of S. Giorgio Maggiore, Venice.

Interference and Stationary Waves. The first recorded and studied observation of the phenomenon of interference was toward the end of the seventeenth century at Batcha in the Chinese Sea, where the tidal wave coming round the southern end of the Philippine Islands, arrives six hours behind the wave that comes round the northern end. Thus, high tide by one coincides with low tide by the other, and the two waves continually neutralize each other. Had the one portion been delayed twelve hours instead of six, the tides at Batcha would have been twice as high as if coming from either channel alone. Similarly in acoustics, if a sound arrives at a point by two paths, one a half wave length longer than the other, the two portions tend to neutralize each other; if on the other hand one path is a whole wave length longer than the other, the two parts strengthen each other. An architecturally important illustration of this phenomenon, known as interference, may be found in the case of sound reflected normally from a wall. At a distance of one quarter of a wave length from the wall the reflected sound meets the oncoming sound, after having traversed a path one half a wave length greater than that of the sound that it is meeting. The two therefore neutralize each other, and approximate silence results. At a distance of one half wave length from the wall the path difference is a whole wave length, and there is mutual reënforcement of the direct and the reflected sounds. These phenomena alternately repeat themselves at increasing distances from the wall. Thus at distances from the wall equal to even multiples of one quarter wave length, there are surfaces parallel to the wall over which the sound of that particular note is intense. At intermediate distances, odd multiples of one quarter wave length from the wall, there are parallel surfaces over which there is approximate silence. At the first system of surfaces the air remains at rest, but changes in density. At the second system of surfaces the air moves rapidly to and fro but without changing in density. Such vibrations are known as stationary waves.

Diffraction. When sound passes an obstacle the waves spread into the region that would otherwise be in shadow, and when for any reason the intensity of the sound on any portion of the wave front is diminished, there is a readjustment tending ultimately to approximate equalization. This process, called diffraction, is greater for low than for high notes.

Resonance. The term "resonance" has been much misused in architectural acoustics, and applied to a phenomenon that might better be called echo, or reverberation, or, with far more precision and significance, residual sound. On the other hand there is a very striking phenomenon often manifested in auditoriums, for which the term "resonance" should be reserved in accordance with its strict scientific significance. Whenever a body in stable equilibrium is displaced slightly, it oscillates to and fro in coming to rest, unless the frictional resistance is excessive. If the force of restitution is proportional to the displacement, the time of oscillation is the same, whether swinging through a large or a small arc. This isochronism was seized on by Galileo in his invention of the ordinary clock pendulum; it is also illustrated in the balance wheel of a watch. If, to a body capable of isochronous vibration, a displacing force is applied periodically, the amount of motion that it produces is comparatively slight, unless the frequency of application of the force and the natural rate of vibration of the body coincide. As this condition is approached the amount of motion becomes very much greater; and the phenomenon, when the periodicity of the force coincides with the natural rate of vibration of the body, whether it has to do with sound or not, is known as resonance. This may manifest itself in an auditorium, especially a small empty auditorium, either by the air acting as the elastic body and the notes in resonance with it swelling into excessive loudness, or in the response of some portion of the wall or floor or contained furniture.

Absorption. Sound, being energy, when once produced in a confined space will continue until either it is transmitted through the boundary walls, or is transformed into energy of another type, for example, heat. For the purpose of the present problem the decay of sound arising from either of these causes will be called absorption. If the boundary wall is the surface separating the confined space from an indefinitely extended medium, as when sound is produced in air above the surface of water, or in a cave in solid rock, the transmission is by the ordinary process of refraction. Should the walls be thin, however, the process of transmission is entirely different, and the problem becomes that of determining how a more or less elastic, heavy, and extended diaphragm follows the vibratory pressure of the air and transmits its motion to the medium beyond. In the wall itself, due to the frictional resistance or viscosity of its motion, there will be an absorption of sound by transformation into heat. It is further immediately evident that the loss of sound at the wall, both by transmission and by transformation into heat, is greater for those notes with which the wall, regarded as an elastic membrane, is in resonance. There is also absorption of sound by the objects in the room, furniture, and audience, and in this case, obviously, by transformation into heat. Finally, there is a very slight absorption of the sound by the viscosity of the air itself.

Architectural Acoustics. The open air auditorium will furnish a good introduction to the enclosed hall.

Open Air Auditorium. For the sake of the greatest initial simplicity the sound may be considered as produced on a level with the ground, in still air, the ground bare, and the sound uninterrupted. If the source of sound be equally efficient in all directions the sound will spread in hemispherical waves, and will have an intensity inversely proportional to the area, that is to say, inversely proportional to the square of the distance from the source. If the ground, instead of being bare, be occupied by a closely seated audience, the sound will be rapidly absorbed by the garments, and the distant part of the audience will receive sound only by diffraction from higher portions of the waves. If the audience, instead of being on a plane, be on more and more rapidly rising ground, the upper portions of the sound wave will be received directly, although still diminished in intensity by diffraction into the audience below. The best that can be hoped for by such construction is that the sound shall diminish no more rapidly than according to the law of the inverse square of the distance. On the other hand, a wall behind the speaker or behind the audience, or even should the barrier be only trees, and especially should it be over-arching trees, would greatly improve the loudness by reflecting the sound that would otherwise be lost. The limiting case is reached when walls and a ceiling transform the auditorium into an enclosed hall, and almost all the sound may be made by reflection ultimately to reach the audience. It is obvious, therefore, that in the absence of reflection a greater elevation of the speaker or a more curved slope to the seats is desirable in an open air auditorium than in an enclosed hall.

Enclosed Auditorium. It is evident that the acoustical advantages of an enclosed auditorium is two-fold-increased loudness, and the exclusion of external disturbing noises. The increased loudness is obtained through the reënforcement of the sound coming directly by the sound that has been reflected from the walls or ceiling. Obviously, in order to reënforce it the reflected sound must arrive before the direct sound has ceased. With prolonged notes this admits of considerable difference in the length of the paths, but with rapidly moving music, or in speech where the articulated elements are changing rapidly, the difference in paths must be small. For a sound whose duration at the source is only one tenth of a second, a difference of path of one hundred feet would be sufficient to prevent reënforcement. Since the audience near the front would receive sufficient sound, the walls and ceiling should be so inclined as to direct the reflected sound upon the audience at the back of the hall. The back walls and more distant side walls, being useful only to the part of the audience near them and worse than useless, with rapidly succeeding sounds, to the front part of the audience, may be occupied to advantage by galleries, which, when cushioned, are good absorbents of sound, and therefore poor reflectors. If this style of construction be not allowed by the other architectural requirements, and the walls must be high and plain, then their upper portions may be constructed, advantageously, of more or less good absorbents. A room having a low ceiling would thus appear to be the proper construction, but this would be an unjustifiable conclusion if applied generally. If the room is designed for the use of a few persons, widely scattered, as for example a council chamber, a low ceiling is desirable acoustically, however much it may be undesirable architecturally. On the other hand, if the audience is to be very large and closely seated, a long, or a long and broad room, with low ceiling, will be a distinct disadvantage, for the sound confined by the low ceiling will be rapidly absorbed by the near part of the audience, and will reach but faintly the distant part. The advocates of this style of construction have likened it to a speaking trumpet and an ear trumpet combined. The analogy is a good one; but it should be borne in mind, that while a trumpet with hard metallic walls is an aid to hearing and to distant propulsion of the voice, a trumpet with walls in great part of highly absorbent material would be very much worse than useless. When the audience must be large, the theatre style of construction, in which by means of galleries the audience is brought as near as possible to the stage, has its obvious advantage. It also has the very considerable advantage that the sound that enters a gallery, having travelled through the space in front at a distance above the audience on the main floor, has lost but little in intensity by absorption. The front part of these galleries are, therefore, very much better acoustically than the main floor immediately below them. Beneath a low and deep gallery, and in the gallery, if the ceiling above it is not high, occurs the same difficulty as in a low, crowded room — the sound is rapidly absorbed at the front and reaches but faintly the rear.

An arrangement of seats has been proposed in which the exposure of the succeeding rows as viewed from the stage is the same; and to the resulting floor curve has been given the name "isacoustic curve." As affording equal opportunities for viewing the stage this arrangement is perhaps justifiable, but as an isacoustic curve, that is, a curve for equal hearing, it is based on considerations so inadequate as not to take into account reflection, diffraction, and that most obvious factor, diminution of sound with distance. It is safe to say that an even approximately isacoustic curve is impossible.

The superposition of the direct and the reflected sound does not always result in increased loudness, but may result in a diminution in intensity, or indeed in complete silence — the phenomenon being known as interference. As above explained, where the interference is between sound approaching a wall normally and the reflected sound, the maxima and the minima of intensity in the interference system are over surfaces parallel to the wall. One maximum is at the surface of the wall, the first minimum is at a quarter wave length distance, and the maxima and minima succeed each other at quarter wave length intervals. In this connection it is interesting to note the wave length of some standard sounds. In air at ordinary temperature the wave length of middle C is about four feet, of tenor C eight feet; the wave length of the lowest audible note is about forty-four feet, that of the highest for the normal ear is about two-thirds of an inch; the wave length of the highest note employed in orchestral music, that by the piccolo, is about three inches. Should the wall be a perfect reflector — and an ordinary wall is a very good reflector — the near minima would give silence, and the maxima would be four times as intense as the sound without reflection. When the sound is not incident normally on the wall the distance between maxima and minima is greater than a quarter wave length; and when there are other reflecting surfaces the maxima and minima are not over plane surfaces, but are at points, the minima no longer being necessarily silence, and the whole system is very complicated. The interference system changes with change in pitch, the maxima and minima changing in position. The distortion that this is theoretically capable of producing in a chord or other complex sound, by altering the relative intensity of the components, is evident. The difficulty, under ordinary circumstances, of detecting it as a factor in the acoustics of a hall arises in part from the fact that no notes employed in music or in speaking are pure notes, also in part from the fact that the unaided ear is not an accurate judge of relative intensity. With a pure, loud, and sustained note, such as can be secured with the aid of resonators, an observer can easily locate, especially in a small empty room, regions in which the sound is loud, and regions in which it is faint. This phenomenon is [illegible]

[illegible] although by [illegible] entirely, [illegible] by the fact that any [illegible] the body and head of the auditor — alters the distribution of maxima and minima, with a tendency, in general, to [illegible]

Intimately connected with the phenomenon of interference is resonance. If, at the centre of a narrow tube with closed ends, a sound be produced, whose half wave length is equal to the length of the tube, the natural rate of vibration of the confined air, regarded as an elastic body, agrees with the rate of vibration of the source of sound; the resulting motion at the centre of the tube is large, and the air at the ends of the tube remains at rest but changes greatly in density, the sound here being intense. A slight alteration of pitch would destroy this resonance. But if the pitch of the source of sound be raised until it is three times as high, that is to say, until, calling the above note C, it is G in the second octave above, the note is again in resonance with the confined air column; the latter now breaks into three parts, the air remaining at rest and changing in density at the ends and at points one third of the length of the tube from each end. The sound is loud at these four points, and the to and fro motion of the air is very great between them. Similarly the tube would reënforce a note five, seven, nine times as high in pitch as the note first defined. The points of rest and motion, called nodes and ventral segments, are due to interference. If the source of sound be placed in other positions the tube reënforces other notes, but all notes reënforced are some even or odd multiple in pitch frequency of the fundamental note above described. If the problem be transferred from a narrow tube to a room, the fundamental note of resonance is much lower, and the higher tones are no longer necessarily harmonics of the fundamental. The accompanying interference system becomes more complicated; nevertheless the phenomenon remains easily perceptible, unless the room is large or contains much absorbing material. It may be detected by gliding the voice slowly through a large range of pitch; as certain notes are reached the resonant reaction of the air on the vocal chords may be distinctly felt, and there is a distinct increase in the loudness of these notes. Similarly there may be resonance between the source of sound and the walls of the room or the contained objects, and reaction, possibly minute, of the latter on the former. In the case of wall resonance there is not, of course, the same connection with the interference system as when the air itself is in resonance. Nevertheless there is some alteration in the character of the interference system, arising from the fact that in the case of a resonant object or wall the intensity of the reflected wave is less.

The practical value of this, the true resonance, whether it be a factor contributing to the good or the bad acoustical quality of an auditorium, has never been in any degree determined experimentally, and it is far from evident, *a priori*, which way the balance stands.

When in an enclosed auditorium a source of sound is abruptly started, maintained at a constant pitch and uniform intensity for a while, and then abruptly stopped, the intensity of the sound at any point in the room varies as follows: It rises abruptly to the value that it would have in open space; as the waves reflected from the walls arrive, and as the interference system forms, the intensity of the sound at a point passes through maxima and minima, approaching a steady value. This generally is greater, but often is less, than the original value, and depends on the place in the room and the wave length of the sound. It now remains constant as long as the source is constant — the rate of absorption of the sound by the walls, the furniture, and the audience being equal to the supply of energy by the source. When the source ceases this balance is destroyed, and the sound dies away, again passing through maxima and minima until no longer audible. The fluctuation of the sound at the beginning is distinct if the sound is a pure note, but is pronounced only when the room is comparatively empty. Practically, however, the auditor is but rarely consciously disturbed thereby. But the residual sound, continuing after the source has ceased until deadened to an inaudible intensity by the absorbing power of the room and its contents, fluctuating as it dies away, is not only distinctly audible in any auditorium, but is the most frequent and exasperating cause of bad acoustical quality. The effect of this is evident. The dragging of one sound into the succeeding, often into several succeeding sounds, is destructive of all distinctness of hearing. The audible duration of the residual sound varies from a fraction of a second to several seconds with an audience present; without an audience present it rarely falls below two seconds in an audience hall of any considerable size, and more often amounts to four or five seconds, at times to even a greater number. Of course the audible duration of the residual sound depends upon the strength of the source. The above figures are given for a middle C diapason organ pipe, winded to the ordinary pressure.

The extent to which residual sound is an evil depends upon the use to which the hall is to be applied. In speaking, the component sounds follow each other in rapid succession, a single syllable often comprising two or more consonantal alterations of the vowel sound, whose distinct audibility is necessary for accurate hearing. Under these circumstances residual sound is in every way an evil. On the other hand, singing and piano music are heard to advantage under conditions in which the duration of the residual sound is considerable, provided also the conditions are such as not to produce distinct echoes. In the case of piano music the residual sound has the effect of diminishing its staccato character, and of sustaining its tone; the result is the increased fulness or roundness of tone that is sought when rugs and heavy hangings are removed from the room in preparation for a concert. Residual sound is favourable, perhaps, to stringed quartet and orchestral music; but it is difficult, as yet, to state exactly the requirements of each case.

The duration of audibility of the residual sound can be determined with great accuracy when appropriate recording apparatus is employed, and when the experiment is carried on in the absence of outside disturbing noises. Thus there is furnished an accurate quantitative measure of at least one factor in the determination of the acoustical quality of an auditorium, and it is a measure, fortunately, that can be calculated in advance of the actual construction. The duration of the residual sound is a function of the volume of the room and the absorbing power of the walls and contained furniture and audience. If equal amounts of absorbing material be added successively to the room, and the duration of the residual sound determined in each case and plotted as ordinates (y) against the amount of absorbing material as abscissæ (x) the resulting curve will be a rectangular hyperbola with displaced origin. In the equation of the hyperbola $(a+x)\,y=K$ the parameter K is a function of the volume of the room, over a considerable range very nearly equal to the volume multiplied by a constant, the ordinarily slight departure from this being due to idiosyncrasies of form. The displacement (a) of the origin is proportional to the absorbing power of the room. Therefore in order to predetermine the audible duration of residual sound from the architect's plans and specifications, the value of K must be calculated from the volume of the room, and $(a+x)$ from an estimate of the absorbing power of the materials used in construction, the amount of surface exposed, and the size of the audience the room is designed to accommodate; these two factors, K and $(a+x)$ substituted in the above formula $(a+x)\,y=K$, will give a measure of the audible duration of residual sound, this being the most frequent and serious defect in the acoustical quality of a room. The above formula is equivalent to the statement that the duration of the residual sound is inversely proportional to the combined absorbing power of the walls, the audience, and the furniture, the constant of proportionality being itself proportional to the volume of the room. A table of the relative absorbing power of a few materials is appended:—

Hair cushions, seats	per sq. m.	2.03
Heavy Oriental rugs on floor	.. .. ..	.56
Chenille draped as a curtain	.. .. ..	1.32
Cretonne cloth hanging free	.. .. ..	.23
Canvas	.. .. ..	.71
Hair felting ½ inch thick against the wall	.. .. ..	1.0
Hair felting 1 inch thick against the wall	.. .. ..	1.6
Hair felting 2 inches thick against the wall	.. .. ..	2.4
Audience, per person		1.[illegible]
Individual man sitting clear		1.8
" woman " "		2.2

The above values are expressed in arbitrary units. However, the units are such that the corresponding value of the parameter K may be calculated by multiplying the volume of the room, expressed in cubic feet, by .0082. A room in actual use having proved at fault on account of residual sound, the duration of this (y) should be determined with the presence of an audience, either by calculation or by direct experiment; and the amount of absorbing material to be added (x_2) should be calculated from the formulæ $ay_1=K$ and $(a+x_2)\,y_2=K$, y_2 being the duration desired. The absorbing material should then be placed either on or in front of those surfaces least efficient in increasing the loudness of the sound to the audience. It is scarcely necessary to add that the arrangement of adequate absorbing material can be much more satisfactorily made in the original design of a hall than as an alteration after construction.

The heating and ventilating system of an auditorium is occasionally an important factor in its acoustics; not as a possible opportunity for gain, but rather as a source from which danger may be expected. Whether the air in a room moves from the speaker toward the audience or from the audience toward the speaker makes but the slightest difference, perhaps equivalent in effect to moving an auditor at the back of the hall a few inches nearer or farther off. Having the air hotter at the ceiling than near the floor is equivalent to a very slight increase in the inclination of the floor. Both effects are easily calculated approximately, in any particular case, but are in no conceivable case worth struggling for. On the other hand the possible danger arises in irregular heating, from the fact that sound loses by reflection at every surface in the air at which there is a change of temperature; and further, when a column of hot air rises from a large register in the floor it acts like a diverging lens, spreading the sound passing through it to the right and left, and thus partially screening the region immediately behind it. One of the earliest recorded cases of the latter effect occurred in the House of Parliament and was reported by the Committee of the House of Commons. Several more recent cases have been reported.

An important requisite in the enclosure of an auditorium is the exclusion of external disturbing noises. This is most effectively accomplished by surrounding it with rooms themselves not devoted to noisy uses, or closed during the hours when the auditorium is likely to be in use. A parapet would protect the roof to some extent from the city noises — a fact of some importance when the ventilating ducts, either inlet or outlet, are short and terminate on the roof. The acoustical insulation of adjacent rooms is secured by the construction of a double wall, having an intervening air gap, or the space filled with sand. The walls should not be tied together, or if that be necessary, the bolts should be insulated from the walls by means of inelastic washers. The greatest difficulty is in the avoidance of communication through the floor; and this is generally the cause of the failures in attempts at insulation that are occasionally reported.

The often repeated statement that a copy of a standard auditorium does not necessarily possess its good acoustical qualities is not justified, and invests the subject with an unwarranted mysticism. The fact is that exact copies have rarely been made, and can hardly be expected. The improvements in the materials used in construction, the consequent alterations in form and surface, the advance in heating and ventilating, and, in addition, the peculiar demands in each case, and the restrictions upon the dimensions enforced by the location, have led to the taking of liberties in what were regarded perhaps as non-essentials. While the problem is complex and, for the best results, extremely difficult, yet it is perfectly determinate, and the solution arrived at is the exact result of the architect's plans and specifications, if these are accurately followed in the building. (See Echo; Isacoustic Curve; Reflector; Residual Sound; Resonance; Reverberation; Sound; Sounding Board; Whispering Gallery.) — W. C. Sabine.

ACOUSTIC VASE. Same as Echea.

ACROLITH. *A.* A statue or figure in relief of which only the head, hands, and feet are of stone, the rest being of wood, or other material.

B. By extension, such a figure of which the extremities are of finer material than the rest, as of marble applied to inferior stone.

ACROPODIUM. A pedestal for a statue, especially when large and high and adorned with unusual richness. A terminal pedestal or gaine when resting upon representations of the human foot, or even of the feet of animals, is sometimes specially called acropodium; but the term in this sense is inaccurate and has no classical warrant.

ACROPOLIS. The fortified stronghold or citadel of a Greek city, usually a steep eminence near its centre, as at Athens, Corinth, or Tiryns. The shrine of the patron divinity of the city or state was sometimes situated within or upon it, as at Athens. The Athenian Acropolis was, indeed, the artistic as well as the military centre of the city and state. Besides the magnificent propylæa by which it was entered, it was adorned with temples and shrines of great beauty, including the Parthenon, Erechtheion, and temple of Nike Apteros. The Acropolis of Corinth was called the Acrocorinthos. (Cut, cols. 25, 26.) — A. D. F. H.

ACROTER. Same as Acroterium.

ACROTERAL; ACROTERIAL. Pertaining to, or having the form of, an acroterium.

ACROTERIUM. *A.* In classic architecture, properly, a pedestal for a statue or similar decorative feature at the apex, or at each of the lower corners of a pediment. None of ancient times remains in place; but in neoclassic work they are frequent.

B. By extension, from the preceding definition, but improperly, a statue or other decorative feature supported on such a pedestal.

ADAM; architect.

The name is painted on the vault of the southern aisle of the Cathedral of Poitiers (France), which was begun in 1162. Adam is supposed to have been one of the architects of that church.

Bauchal, *Dictionnaire*; Robuchon, *Paysages et Monuments du Poitou.*

ADAM, FRANÇOIS GASPARD; sculptor; b. 1710, at Nancy; d. 1759.

François Gaspard was the youngest son of Jacob Sigisbert Adam. He was associated with his brothers Lambert Sigisbert and Nicolas Sébastien (see Adam, L. S. and Adam, N. S.). In 1747 he was invited by Friedrich II. (Frederick the Great) to Prussia, and held the office of first sculptor of his court until his death.

(For bibliography see Adam, L. S.)

ADAM, JAMES; architect; d. Nov. 20, 1794.

James Adam was one of the four sons of William Adam (see Adam, William), and appears to have ranked next to Robert Adam in reputation. It is not possible now to separate the work of the brothers. His name appears with that of Robert in the title of their *Works in Architecture.* (See Adam, Robert.)

(For bibliography see Adam, Robert.)

ADAM, JOHN; architect.

John was the eldest of the four sons of William Adam.

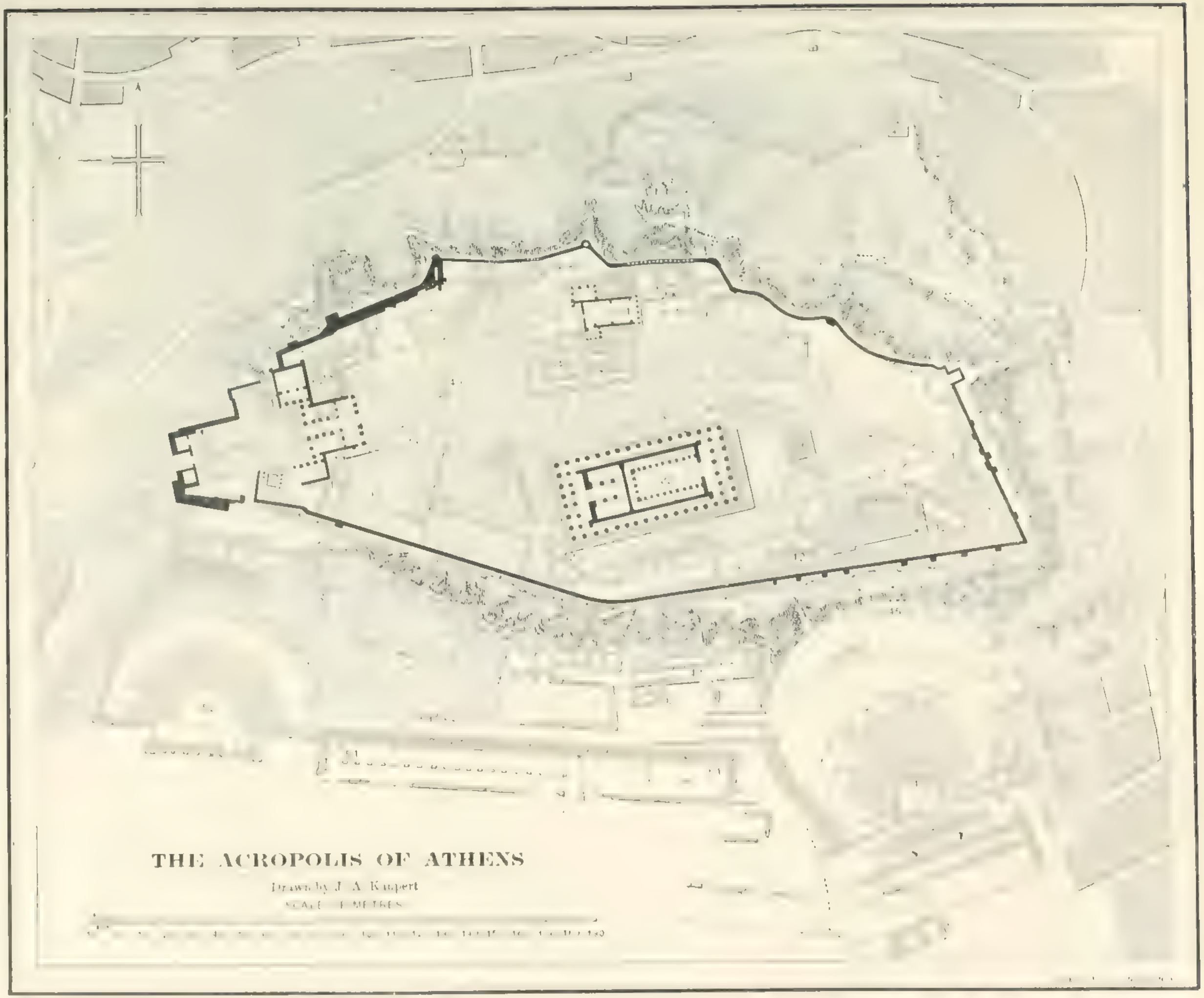
(For bibliography see Adam, William and Robert.)

ADAM, LAMBERT SIGISBERT; sculptor; b. 1700, at Nancy; d. April, 1759.

The oldest of the three sons of Jacob Sigisbert Adam, a sculptor of Nancy, France. He went to Paris in 1719 and in 1723 won the *Grand*

A PLAN OF THE ACROPOLIS OF ATHENS

5 Temple of Nike Apteros.
6 Propylaea
12 Fortified wall of Pelasgic work.
13 Precinct of Artemis Brauronia.
20 } The two modern museums.
21 }
22 Parthenon
26 Roman Temple (traces only).
31 Erechtheum
34 Temple of Athena before the Persian invasion
40 Place of colossal bronze statue of Athena Promachos.
42 Theatre of Dionysus.
45 Choragic Monument of Thrasyllus.
47 Sanctuary of Esculapius.
51 Portico of Eumenes.
52 Odeum of Herodes Atticus



THE ACROPOLIS OF ATHENS

Drawn by J. A. Kaupert

SCALE OF METRES

Palais de Rome. In Rome he studied especially the work of Lorenzo Bernini (see Bernini). In 1730 he took part in the competition for the fountain of Trevi in Rome (see Salvi, Nicolo). In 1733 he returned to Paris, and was joined by his two brothers Nicolas Sébastien and François Gaspard (see Adam, N. S. and F. G.). The most important of their undertakings is the great fountain of Neptune in the park of the palace at Versailles.

Thirion, *Les Adam et Clodion*; Gonse, *Sculpture Française*.

ADAM NICOLAS SÉBASTIEN; sculptor; b. 1705, at Nancy, France; d. 1778.

He followed his older brother, Lambert Sigisbert Adam, to Paris in 1721, and to Rome in 1724, and he helped him in much of his work. One of his most characteristic performances is the monument to Catherine Opalinska, queen of Stanislas I., King of Poland, in the Church of the *Bon Secours* at Nancy.

(For bibliography see Adam, L. S.)

ADAM, ROBERT; architect; b. 1727, at Kirkealdy, Scotland; d. March 3, 1792.

Robert Adam was the second son of William Adam (see Adam, W.), and the most eminent of the four brothers Adam: John, Robert, James, and William. He was educated at Edinburgh University and visited Italy in 1754. He visited also Dalmatia, and published the *Ruins of the Palace of the Emperor Diocletian at Spalatro in Dalmatia* (London, 1764, 1 vol. folio with engravings by Bartolozzi). In association with his brothers he began in 1768 to build the Adelphi (London), a vast terrace constructed on arches which contain warehouses and support streets and houses. The brothers, especially Robert and James, seem to have originated the practice of grouping unimportant London houses into masses having the appearance of single imposing edifices. They were especially successful in designing the interior arrangement, decoration, and furniture of residences. They commenced the publication of their works in 1773. The second volume was completed in 1778. A posthumous third volume was added, and the whole published in 1822 with the title, *Works in Architecture of the late Robert and James Adam, Esqs., complete in three vols. with 125 plates engraved by Bartolozzi*, *Piranesi*, etc. Robert Adam was buried in Westminster Abbey.

Redgrave, *Dictionary of Artists*; Fergusson, *History of Modern Architecture*; Wheatley, *The Adelphi and its Site*.

ADAM, WILLIAM (I.); architect; d. June 24, 1748.

William was the father of the brothers, Robert and James Adam (see Adam, Robert and James). He designed a large number of residences in Scotland, the library and University of Glasgow, the town hall of Dundee, the royal infirmary, the orphan's hospital, Edinburgh, etc. William Adam held the office of King's Mason at Edinburgh.

ADAM, WILLIAM (II.); architect; d. January, 1822.

One of the four sons of William (I.) Adam (see Adam, William, I.). He outlived his brothers and concluded their various undertakings.

(For bibliography see Adam, Robert.)

ADEODATUS (Deodatus) (see Cosmati).

ADMIRALTY, THE. At Whitehall in London; the central office of the British naval administration: the building was completed about 1726, by Thomas Ripley (see Ripley). The screen on the Whitehall front is by Robert Adam (see Adam), about 1760; graceful, but very small and slight.

ADOBE. (Mexican-Spanish: *adobe*, from *adobar*, to plaster; originally from the Arabic. In Spanish America this word meant an earthen building block not hardened by fire. In English it has grown to be a generic term covering a whole class of materials and structures made from earths, more or less aluminous, without artificial heat.)

(1) An aluminous earth; (2) unfired brick made from that earth without fire; (3) with the article, a single brick of this kind; (4) a house built of these materials.

ADOBE BRICK. Commonly "an adobe"; one made of adobe earth and water, hardened without artificial heat. This kind of brick, made without straw, was used in America, especially in Mexico, long before the European advent, or even before the brilliant development of the Aztecs. The great Mound of Cholula is composed largely of adobe brick, and it is believed to antedate the Aztecs. In New Mexico, a variety was found in use when the Spaniards first went there in 1540. It was in the shape of round balls, moulded in the hands, from a mixture of earth, charcoal, ashes, and water, and sun dried. This was probably the most primitive form of adobe brick. Adobe bricks were found of different dimensions in the same work; twenty inches by ten by five was a common size in the Cholula Mound. They were laid in adobe mortar, and the joints were broken. Since the Conquest, straw has been mixed with the adobe. (See Cajon; Communal Dwelling; Adobe Masonry, under Masonry; Pisé; Pueblo House. — F. S. D.

ADOBE CLAY. Clay containing sufficient aluminous matter to form a bond in adobe construction or pottery.

ADOBE CONCRETE. A mingled mass of stone and adobe mortar.

ADOBE EARTH. Same as Adobe Clay.

ADOBE MORTAR. A soft mixture of adobe clay and water used as a mortar in the Southwestern United States and in Spanish

America, especially in laying adobe brick. It was the only kind of mortar used in American-Indian architecture, north of Mexico.

ADOBE MUD. Adobe and water mixture either in a general sense, or as meaning plaster or mortar so made.

ADOBE PLASTER. Plaster made of adobe and water.

ADOBE SOIL. Same as Adobe Clay.

ADRIAN, LAURENTIUS; sculptor.

In 1531 Laurentius Adrian carved the wooden Reinhold statue in the *Artushof* at Danzig (Prussia). The *Artushof*, called also *Junkerhof*, has one of the finest Gothic interiors in Germany.

Lubke, *Geschichte der Renaissance in Deutschland*; Schultz, *Danzig und seine Bauwerke*.

ADYTON; ADYTUM. In Greek architecture the most sacred part of a temple or sacred enclosure.

ÆDES. In Roman architecture, any building. A distinction was maintained between *templum*, a regularly consecrated structure, or enclosure, and *ædes sacra*, which was a building set apart for pious purposes but not regularly consecrated. In modern inscriptions the term is applied to any public building and is accepted as the equivalent of the English word.

ÆDICULA. In Roman architecture, a small building; by extension, a shrine set up within a large edifice. Such a shrine may be a mere box or enclosure of wood, or, perhaps, only a screen with pedestal and statue in front of it.

ÆDILE (Latin *Ædilis*). A Roman city officer, having special charge of public buildings and streets, and of municipal affairs generally.

ÆDILITY. The government or the care of a city considered with reference to the public buildings, streets, squares, water supply, and other similar functions and duties.

ÆRUGO. The composition formed upon ancient bronzes by exposure; usually being carbonate of copper, but differing in composition according to the nature of the metal or the soil in which it may have been buried. (See Patina.)

ÆSYMNIUM. A building erected by or in honour of a person named Æsymnios; especially a tomb in Megara named by Pausanias, I., 43, 3.

AGELAIDAS; sculptor. Flourished 520–465 B.C.

Agelaidas was the chief of the school of Greek sculptors associated with the city of Argos. He was the teacher of the three greatest sculptors of the succeeding generation, Myron, Phidias, and Polyclitos. (See Myron; Phidias; Polyclitos.)

Collignon, *Sculpture Grecque*; Lowy, *Inschriften Griechischer Bildhauer*.

AGGER. In Roman building, a large mound or rampart, as of earth. It is applied to the great mound which backs the early wall of Rome, the agger of Servius Tullius, and sometimes to that wall itself, because consisting mainly of an embankment merely faced with dressed stone.

AGGREGATE. Any hard material used in small fragments to mix with mortar for forming concrete.

AGIASTERIUM. In the early church, a sanctuary; especially, that part of a basilica in which the altar was set up.

A GIORNO. Same as A Jour; the Italian form of the phrase.

AGNELLI, FRA GUGLIELINO; sculptor and architect.

The oldest of the pupils of Niccolò da Pisa. (See Niccolò da Pisa.) He was employed on the "Arca di San Domenico" in Bologna begun by Niccolò da Pisa. His pulpit in the Church of S. Giovanni fuorcivitas at Pistoia dates from about 1270. According to Fumi (op. cit. p. 170) Agnelli was one of the architects employed on the Cathedral of Orvieto at its commencement in 1293.

Reymond, *Sculpture Florentine*; Fumi, *Duomo d'Orvieto*; Marchese, *Memorie*.

AGNOLO GADDI. (See Gaddi, Agnolo.)

AGNUS DEI. A representation in painting or sculpture of the lamb as typical of Christ.

AGORA. In Grecian archæology, the market place or open square in a town, nearly corresponding to the Italian Forum. Covered porticoes (see Stoa) were built along the sides of the square, in some cases. But little that is certain has been ascertained concerning the arrangement of any agora of classical Greece.

AGOSTINO D'ANTONIO DI DUCCIO; sculptor and architect; b. about 1418; d. after 1490.

His earliest known works are four reliefs on the façade of the Cathedral of Modena signed Agvstinvs. De. Florentia. F 144. . . . He is supposed (Yriarte, op. cit.) to have spent the period between 1446 and 1457 at Rimini, employed upon the sculpture of the Church of S. Francesco under the direction of Matteo de' Pasti. (See Pasti, Matteo de'.) About 1457 he began his most important work, the façade of the oratory of San Bernardino at Perugia, signed Opvs. Avgvstini. Florentini. Lapicidæ. M[illegible]

Yriarte, *Agostino di Duccio*; Yriarte, *Rimini*; Muntz, *Renaissance*.

AGRAFE. *A.* A cramp or hook used in building; a term used in different senses, but rare.

B. The sculpture in relief put upon the keystone of an arch in ancient Roman, and in post-classic work. Thus, the archivolt of the Arch of Titus (which see) is enriched by an elaborate scroll ornament, upon which is placed a figure almost completely detached from the background.

AGUGLIA. Same as Guglia.

AGUSTI, MAESE JUAN; architect.

Agusti directed the construction of the Cathedral of Gerona, Spain, from June 6, 1471, to July 21, [illegible]

Viñaza, Adiciones al *Diccionario Historico*.

AILERON. A half gable, such as closes the end of a pent house roof, or of the aisle of a church. The term signifies, of course, one of two wings. In neoclassic architecture an attempt is frequently made to disguise the actual structure, the sloping roof of the aisle; and the aileron takes a nearly independent place as a wing wall shaped like a scroll, as in S. Maria Novella, at Florence; or commonly, like a quarter circle or similar curve, as in S. Zacharia, Venice.

AIR CHAMBER. A chamber formed by enlargement or vertical extension of pipes, intended to contain air to form a cushion, as on the supply pipes to plumbing fixtures, at suction and discharge ends of pumps, etc. (See Plumbing; Ventilation; Warming.) — W. P. G.

AIR DRAIN. *A*. A flue arranged to provide a supply of air to a fireplace, or the like. (See Air Duct.)

B. Same as Dry Area (which see under Area).

AIR DUCT. A pipe or boxlike construction, generally of sheet metal or wood, to convey fresh air to a room, air to the air chamber of a furnace, hot air from a furnace, or the like. This term is more often used for the temporary or slight construction, as distinguished from air drain, which is of masonry: but the distinction cannot be maintained in all cases.

AIR LOCK. A chamber of access to a pneumatic caisson, tunnel heading, or other enclosure containing compressed air, serving a purpose like that of a lock on a canal. It is usually a cylinder built into the roof or wall of the air chamber. It has an air-tight door at each end, opening toward the compressed air, and is supplied with air cocks. In operation, the outer door being open to the atmosphere, the man enters the lock; the door is closed; he opens the air cock connected with the compressed air, which flows in until the pressure in the air lock becomes the same as that in the caisson or the other chamber; he then opens the inner door and passes out of the lock into the chamber. He leaves the chamber by entering the lock and closing the door between; he then opens the air cocks communicating with the outer air. The compressed air escapes, and the pressure is reduced to that of the outer air so that he can open the outer door. Materials of construction and excavated material are similarly introduced and removed through similar air locks.—W. R. HUTTON.

AIR PIPE. In plumbing, a pipe by which a waste pipe or trap is extended to the outer air, generally above the roof. (See Back Venting; Vent Pipe.) — W. P. G.

AIR SHAFT. A space reserved for the free passage of air, vertically or nearly so; whether small, like an air drain, air duct, or air flue, or forming a small courtyard among high buildings.

AIR SPACE. *A*. The space available for the air needed for respiration, as in a sick room or hospital. Thus it is alleged that the air-space of a room is of no avail above 12 feet from the floor; it is said that the air space per man in a barrack room is so many cubic feet.

B. A clear space left between parts of a wall or roof, and intended to exclude dampness; especially between two walls tied together and forming the external wall of a building. Where this precaution is used furring is not needed. It is good to put the heavier part of the wall within, so as to carry the beams the more easily; thus, in a dwelling house, an 8-inch wall of brick on the inner face, a 2-inch air space, and a 4-inch wall without, the two walls being well tied together, will give sufficient strength. In a fireproof bank building, a 20-inch wall has been used to carry the beams, there is a 2-inch air space and an outer 8-inch wall made up partly of brick and partly of stone carefully dressed at the back, so as not to invade the air space. R. S.

AIR TRAP. Same as Stench Trap.

AIR TRUNK. A pipe for ventilation or for the admission of air to a furnace; commonly of rectangular section; of wood or sheet metal, and not built into a wall or floor but secured in its place by hangers or brackets: the same as air duct, but always of considerable size.

AIR WOOD. Wood seasoned by long exposure to the open air, as distinguished from wood that has been dried by artificial heat.

AISLE. *A*. In a building whose interior is divided into parts by rows of columns or piers, one of the side divisions, usually lower and smaller than the middle division. In ancient Roman basilicas, Christian basilicas, and the greater number of churches of all epochs, the aisles are straight and parallel, adjoining the nave, the choir, and the higher and chief part of the transept, or such of these divisions as may exist; where, however, the termination of east end, west end, or transept is finished in a rounded apse, the aisle may be continued around the curve (see Deambulatory). In round churches the aisle is concentric with the nave, and surrounds it.

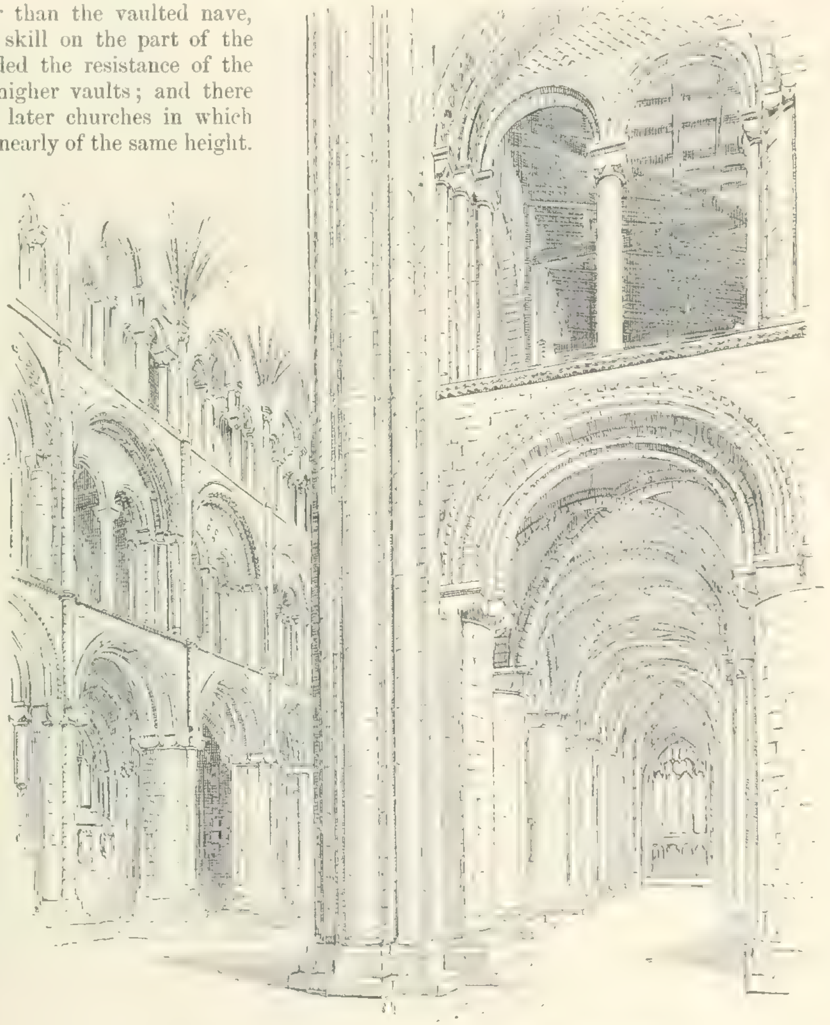
In a few large churches there are two aisles on each side of the nave; in a very few, as in the Cathedral of Antwerp, there are three on each side. In many cruciform churches the aisle stops at the transept; in others it returns along one side only, usually the east side, of the transept: in very large churches it sometimes returns on each side, so that a cross section through the transept resembles a similar section across the nave.

In most churches, from the fifth century A.D. to the present time, the roofs of the aisles are lower than the nave roof, etc., so as to allow the direct admission of light through windows pierced in the higher walls above (see Clerestory); but in Romanesque churches of central France and on the Rhine the aisles are but little lower than the vaulted nave, etc., from lack of skill on the part of the builders, who needed the resistance of the aisle roofs to the higher vaults; and there is a small class of later churches in which nave and aisles are nearly of the same height. Churches of this class are called *Hallenkirchen* in Germany, that is, churches resembling halls. Such are the Cathedral (S. Stephen) at Vienna in Austria, that of Carcassonne in southern France, that of Erfurt on the Rhine, and the Church of S. Sebaldus in Nuremberg, Bavaria. The nave vault may be crowned up a little higher than the aisle vault; but there is no clerestory wall with windows.

The aisle is usually only one story in height; but in a few Romanesque churches, such as the Cathedral of Tournai in Belgium, and in one or two later ones, such as the Cathedral Notre Dame of Paris, there is an upper story, usually called a gallery, and probably used in the Middle Ages as a place of safe keeping for the property of persons going on a pilgrimage or a crusade.

B. By extension, any one of the longitudinal divisions of an oblong basilica or church; thus, the nave or the higher part of the choir is called the middle aisle, and a church with two aisles on each side is said to be five-aisled. This use of the term is to be contrasted with the French use of *nef* for any longitudinal division.

C. By extension, and, perhaps, by confusion with Alley (which see), a walk or passage in a church, or any hall arranged for an audience, giving access to the seats. In this sense wholly popular and modern. — R. S.



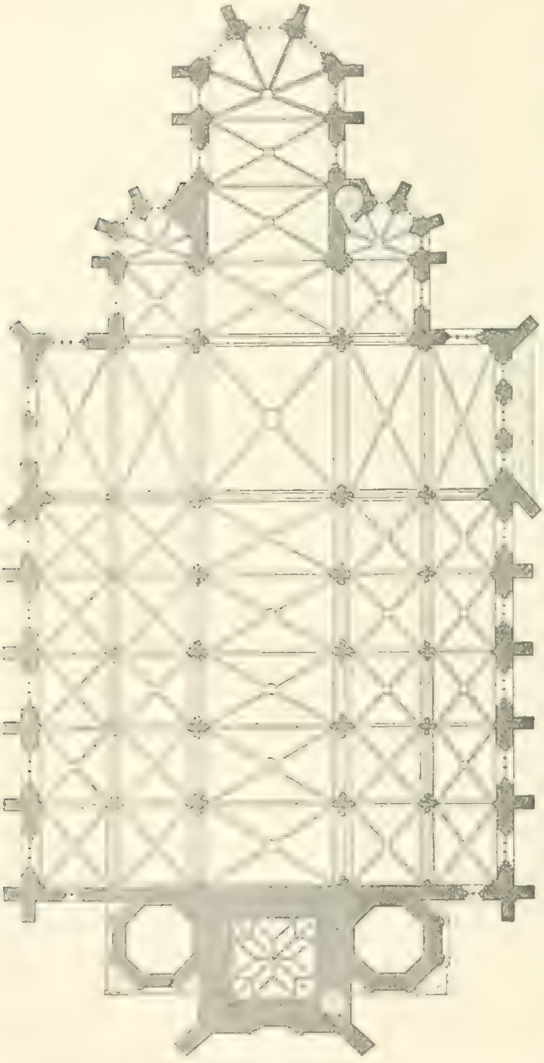
Aisle: South Aisle of Peterborough Cathedral

Choir Aisle. One of the aisles which flank the choir, as distinguished from the nave; or, in the case of a rounded east end, the whole aisle next the choir taken together, including the deambulatory.

Nave Aisle. One of the aisles which flank the nave of a church, as distinguished from choir and transept.

Transept Aisle. The aisle of a transept, corresponding to that of the main body of the church.

AISLED. Furnished with aisles; most commonly in combination, forming a term distinguishing the number of aisles, as the Cathedral of Antwerp is seven-aisled. In these cases, the nave is considered as one of the aisles, and the term expresses the number of separate parallel divisions of the structure. (Cut, col. 38.)



Aisled: A Five-aisled Church; Church of S. Mary, Mulhausen, Prussia, Germany.

AIWAN. A reception hall, as in ancient Parthian buildings. (See Parthian Architecture.)

AJARCARA. In Spanish architecture, ornamental relief in brickwork.

A JOUR. In French, pierced through, so that light shines through from side to side; said of carving when the background is pierced at intervals, or cut entirely away, so that the scroll or other ornament remains detached. In ornamental art the term is sometimes employed when the background is transparent, as when enamels or glass are fitted in to form it.

AKKADIAN. Same as Accadian.

ALA. In Roman architecture, a small room on either side of a larger one, or of a court. In many Roman houses it takes rather the form of a recess or alcove. (See House.)

ALABASTER. *A.* A variety of gypsum; a sulphate of lime more or less translucent and of a prevailing white colour, though often clouded and veined with brownish red and other tints. It is soft enough to be readily cut with a knife. A variety brought from Derbyshire in the south of England is used for altar rails in churches and similar decorative adjuncts to buildings, but its softness prevents its being durable. The Italian variety, which, as exported, is more nearly white, is used chiefly for small vases, statuettes, and the like, which are called "Florentine Marbles."

B. A variety of calcite known as the calcareous or Oriental alabaster, and supposed to be the Alabastrites of the ancient writers. This material, which is much harder than that in sense *A*, was very largely used in the works of the Romans of antiquity, and quarries in Egypt have been drawn upon in modern times for buildings in Cairo, and even in Europe. The quarries now known, however, would not furnish such large and perfect pieces of hard alabaster as have been found in the ruins of Rome, or as those which stand in the Church of S. Marco in Venice.

ALABASTRITES. In Roman archæology, a semiprecious stone, probably the Oriental or calcareous alabaster.

A LA GRECQUE. Having to do with real or supposed Greek taste or Greek design; applied especially to the fret, meander, or key ornament. (See Meander.)

ALAMEDA. In Spanish tongues, a promenade, or public garden. These are usually not very large nor of the nature of parks; they are rather alleys or avenues planted with trees and furnished with fountains, seats, etc.; little grass and a general covering of gravel, or the like. The formal gardens attached to some towns in the south of France, as Montpelier, should be compared with these.

ALARM. Any appliance by means of which the attention of inmates may be called to the hour of the day or night, to fire, to the opening of doors or windows, or the like. (For fire alarms, which are generally electrical in their principle, see Thermostat under Electrical Appliances. For Burglar Alarm see that term under Electrical Appliances.)

ALASKA, ARCHITECTURE OF. (See United States, Architecture of, Part I.; and Eskimo Architecture.)

ALAVOINE, JEAN ANTOINE; architect; b. 1778, at Paris; d. Nov. 14, 1834.

Alavoine served with Napoleon's army in Italy. In 1804 he returned to France and entered the *École d'Architecture.* He built the central spire of the Cathedral of Rouen in place of the one which was burned Sept. 15, 1822 (see Becquet, Robert). Alavoine was charged with the construction of the Colonne de Juillet in the Place de la Bastille (Paris). After his death his design was modified by his successor Louis Joseph Duc (see Duc, L. J.).

Lance, *Dictionnaire*; César Daly, *Monument de Juillet.*

ALBERT. (See Albrecht.)

ALBERT; ecclesiastic and architect.

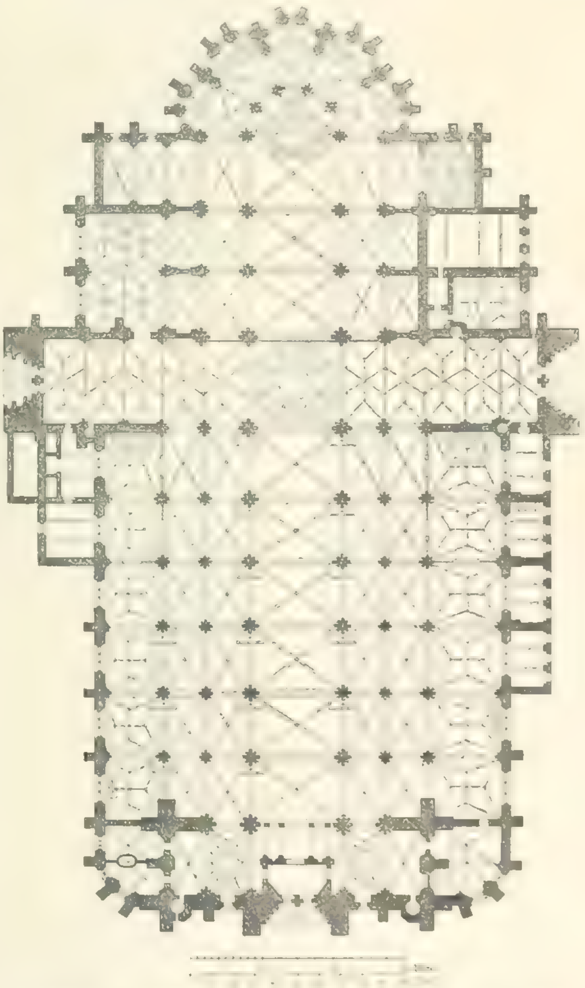
Albert was archbishop of York after 767. He completed the construction of the earliest Cathedral of York, which was begun by his predecessor, Egbert, and burned in 1069. This building is described by the famous Alcuin, who was associated with Albert in the work.

Britton, *Architectural Antiquities*; Britton, *Cathedral Antiquities.*

ALBERT II.; bishop of Hildesheim. (See Bonensack.)

ALBERTI (Leone Battista degli); scholar and architect; b. Feb. 18, 1404; d. April, 1472.

Alberti assumed the literary name Leo (Leone) in Rome. He was born at Venice during the banishment of the Alberti, one of the most distinguished Florentine families. Although a natural son, his father Lorenzo educated him with extreme care. He possessed great strength and was devoted to horsemanship and athletic sports. He excelled in mathematics and mechanics, and is said to have invented the *camera oscura.* The Alberti were restored to Florence in 1428, and became closely allied to the Medici family. Leone Battista was appointed to the office of *Scrittore ed abbreviatore delle lettere apostoliche,* in which he served six popes (Martin V. to Paul II.). His residence was in Rome. He conducted his work in other cities by visits, correspondence (some of his letters still exist), and the assistance of competent persons. (See Gambarelli, B.; Fancelli; Pasti.) The documentary evidence about his buildings is meagre. Vasari gives a list of works in Rome which have disappeared. He was doubtless associated with B. Gambarelli (Rosselino) in the attempted reconstruction of S. Peter's. The reconstruction of the Church of S. Francesco in Rimini (*il Tempio Malatestiano*) was begun on the inside at the chapels near the door by Matteo Pasti. Alberti appears to have been called in by Sigismondo Malatesta about 1447 to design the marble exterior and especially the façade, suggested by the arch of Augustus at Rimini. In May, 1459, Alberti followed the court of Pius II. (Pope from 1458 to 1464) to Mantua, where he built for Lodovico Gonzaga the little Church of S. Sebastiano. The more important Church of S. Andrea in Mantua was begun in 1472, the year of his death. Its plan, undoubtedly by Alberti, shows an interesting treatment of intersecting barrel vaults, which seems to have been copied by Bramante (see Bramante) in his design for S. Peter's. He probably continued the [illegible]



Aisled: A Seven-aisled Church; the Cathedral of Antwerp, Belgium.

zaga the tribune of the Church of the Nunziata in Florence, begun by Michelozzi (see Michelozzi). Alberti is supposed to have built in Florence for Giovanni Rucellai the Rucellai palace about 1445–1451. A manuscript in the library at Florence, however, ascribes this building to B. Gambarelli (Rossellino), who probably acted as Alberti's associate. He built the Chapel of S. Pancrazio (before 1467) and the main front of the Church of S. Maria Novella (about 1470).

Alberti's *De Re Ædificatoria Lib. X*, the first great book of the Renaissance on architecture, was begun in 1449 and published after his death, in 1485. The *Della Pittura libri tre*, dedicated to Brunellesco, 1435; *I Cinque Ordini Architettonnici* and *Della Statua* (after 1464) are published by Janitscheck in Alberti's *Kleinere Kunsttheoretische Schriften* (Vienna, 1877). A complete edition of his works has been published (*Opere Volgari di Leon Battista Alberti*; five vols., Florence, 1845).

Geymuller-Stegmann, *Die Architektur der Renaissance in Toscana*; G. Mancini, *Vita di Alberti*; Passerini, *Gli Alberti di Firenze*; *Vasari*, Blashfield Hopkins ed.; Leroux d'Agincourt, *History of Art by its Monuments*; Yriarte, *Rimini*; Tonini, *Guida di Rimini*; von Reumont, *Lorenzo de' Medici*; Janitscheck, Alberti's *Kleinere Schriften*.

ALBERT MEMORIAL. Properly, the "National Memorial Monument to the Prince Consort," in Hyde Park, London. It is purposely placed nearly on the site of the Great Exhibition of 1851. It is a very large canopied tomb in a revived Italian Gothic style, with a colossal seated statue of Prince Albert, and a very richly sculptured base. It was designed by G. G. Scott (see Scott, G. G.), and finished about 1872.

ALBERTUS ARGENTINUS. (See Albrecht von Strasburg.)

ALBRECHT; architect.

He succeeded Meister Ludwig (see Ludwig) as architect of the Cathedral of Regensburg (Ratisbon), Bavaria, and appears to have built the choir of this church from plans already laid down.

Niedermayer, *Künstler und Kunstwerke der Stadt Regensburg*; Nagler Mayer, *Künstler-Lexicon*.

ALBRECHT VON STRASBURG (Albertus Argentinus); architect.

His memory has been preserved in the little manuals (*Steinmetzbüchlein*) of the mediæval apprentices, and in the traditions, oral and written, of the mediæval Masonic lodges (*Bauhütten*). He is not mentioned by any chronicler or in any historic document. According to tradition Albrecht took up in 1050 the construction of the Cathedral of Strasburg abandoned in 1028.

Gérard, *Les Artistes de l'Alsace au moyen âge*.

ALBUM. In Roman Archæology, a contrivance for displaying publicly legal and other notices. One form of the album seems to have been a panel of whitened wall, as has been found in Pompeii.

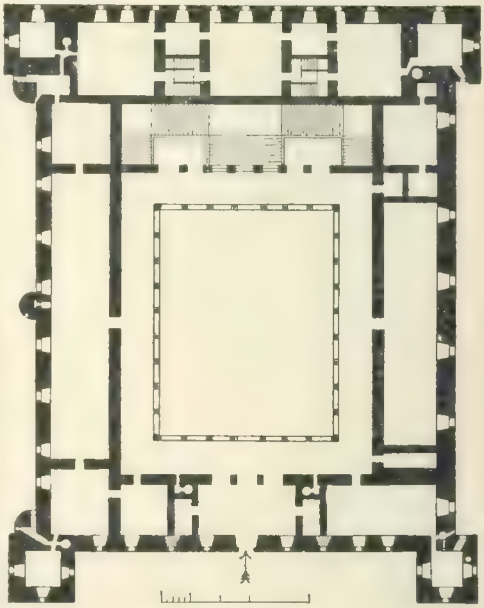
ALCAMENES; sculptor.

According to Pliny, Alcamenes was born at Athens. Other authorities call him a native of the island of Lemnos. He was a pupil, and according to some a rival, of Phidias (see Phidias). He flourished from 448 B.C. until the end of the fifth century. The sculpture of the western pediment of the temple of Zeus (Jupiter) at Olympia is attributed to Alcamenes by Pausanias. The crude character of the work and its early date (about 456 B.C.) make this attribution doubtful. (Collignon, op. cit., Vol. II., p. 458.)

Collignon, *Histoire de la sculpture Grecque*; Furtwangler, *Meisterwerke der Griechischen Plastik*; *Pausanias*, Translation and Commentary by J. G. Frazer.

ALCANTARA. In Spanish building and archæology, a bridge. The term is extended to constitute the name of at least one important town in Spain, and, also, to a valley in Portugal near Lisbon, which is crossed by a great aqueduct bridge built during the eighteenth century, which bridge, perhaps, gives its name to the valley.

ALCAZAR. In Spain, a palace, generally royal, which is defensible, though not necessarily a strong fortress. The buildings remain from the time of Moorish domination, and often contain much Moorish decoration. The best-known examples are those of Segovia, Seville,



ALCAZAR OF TOLEDO.

Plan at level of great Patio which is a noble court with double arcade. The exterior is like that of a fortress.

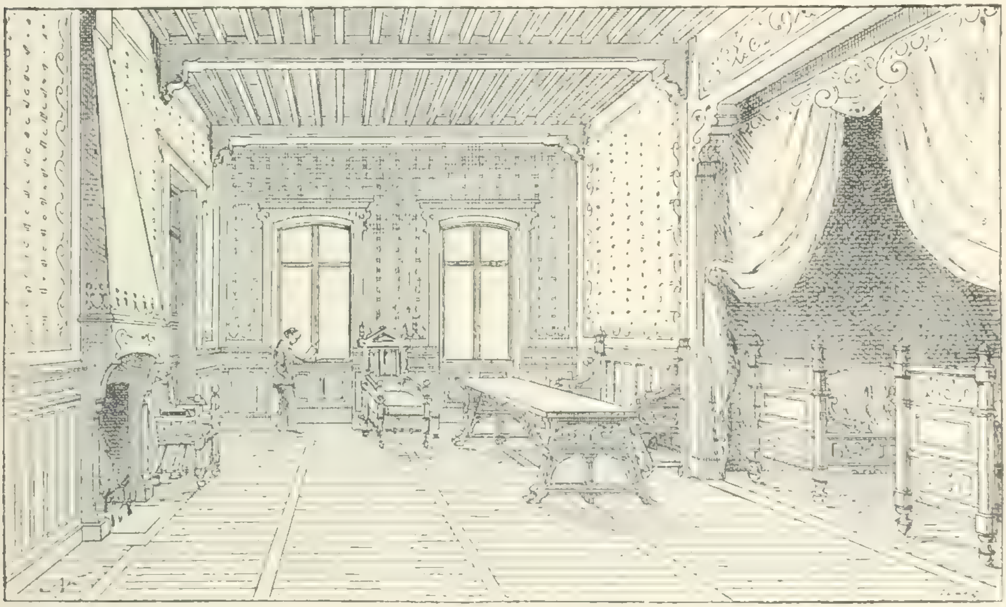
and Toledo, together with the Alhambra (which see), which is an alcazar as well as the others, though not so called in English books.

ALCOCK, JOHN; bishop, d. about 1500.

The eminent ecclesiastic and statesman, John Alcock, was bishop successively of Rochester (1471), Worcester (1477), and Ely (1486), and erected important buildings at each of these places. He was twice lord chancellor. Alcock was associated with Reginald de Bray (see Bray, R. de) as surveyor of the royal works and buildings in the reign of Henry VII.

Leslie Stephen, *Dictionary of National Biography.*

ALCOVE. *A.* A recess opening out of a bedroom and intended to contain the bed; usually altogether, so that curtains at the opening of the alcove may conceal it entirely. This seems to be the primary use of the word, in English as in French.



B. A recess, niche, grotto, space enclosed by trees, or any such retired place. (For a special use of the word see Library; also Seminar Room; for the library alcove is sometimes used in this capacity.)

ALDRICH, HENRY; clergyman and architect; d. 1710.

Dr. Aldrich was dean of Christ Church College (Oxford) in 1689. He resided long in Italy in association with eminent architects and musicians. He planned and built three sides of Peckwater court, Christ Church College, and the parish Church of All Saints in the High Street; and was a principal adviser in the construction of the Chapel of Trinity College, which he probably designed, although it is known that Sir Christopher Wren (see Wren) was also interested in it. One of his best works is the garden front of Corpus Christi College. All the buildings mentioned are in Oxford. The manuscript of his *Elementa Architecturæ Civilis* was acquired by his friend Dr. Clarke, also an architect (see Clarke, G.), and was published with a translation by the Rev. Philip Smith in 1789. Aldrich composed music which is still in use.

Walpole, *Anecdotes of Painting*; Wade, *Walks in Oxford.*

ALESSI, GALEAZZO; architect; b. 1512, at Perugia, Italy; d. Dec. 31, 1572.

He was probably a pupil of Giambattista Caporali, the translator and commentator of Vitruvius. He went to Rome about 1536, where he appears to have been associated with Michelangelo (see Buonarroti). In 1542 Galeazzo went to Perugia and built there the chapel and loggia of the Cittadella Paolina. Other buildings in Perugia are ascribed to him. His most important works are in Genoa, the earliest being the Church of S. Carignano, for which the contract was made Sept. 7, 1549. He enlarged the port and built the arsenal, which he adorned with a Doric portico. Alessi is best known by the street of palaces which he built in Genoa, the Strada Nuova (now Garibaldi), in which are the Palazzi Cambiaso, Gambaro, Parodi (begun 1507), Spinola (1560), Giorgio Doria, Adorno, Serra, and Rosso. (See Lurago, R.) He built the Palazzo Grimaldi near the Church of S. [illegible], another Palazzo Grimaldi in the [illegible] S. [illegible], the two Palazzi [illegible], and many villas near Genoa.

T[illegible] (1567) of the Cathedral of [illegible] are by him. [illegible] Palazzo Marino, now the municipal palace, the façade of the Church [illegible] (see Bramante), the hall of the Auditorio del Cambio and the Church of S. Vittore di Capo. Like the San Gallo, Scamozzi, and other architects of the time, Alessi enjoyed a large practice in Italy, and designed many buildings in France, Portugal, and Flanders. The architecture of Flanders, which was then in close commercial relation with Genoa, was much influenced by him.

Redtenbacher, *Baumeister der Renaissance;* Müntz, *Renaissance;* Reinhardt, *Genua;* Rubens, *Palazzi di Genova;* Gauthier, *Édifices de Gênes;* Gsell-Fels, *Ober-Italien.*

ALETTE. In Roman architecture, and in styles derived from this, those parts of a pier which flank the central pilaster or engaged column, and which form the abutments of the arches. (See Roman Order.)

ALEXANDRINE. *A.* Concerning Alexander the Great and his successors, their dominions and their cities and buildings.

B. Concerning the city of Alexandria in Egypt. (For both, see Egypt, Architecture of; Grecian Architecture; Sarcophagus; Syria, Architecture of.)

ALEXANDRINUM OPUS. (See Mosaic.)

ALFONSO, JUAN; sculptor.

Juan Alfonso was employed with others on the façade of the Cathedral of Toledo, Spain, about 1418.

Bermudez, *Diccionario Historico.*

ALGARDI, ALESSANDRO; sculptor and architect; b. 1602, at Bologna; d. 1654.

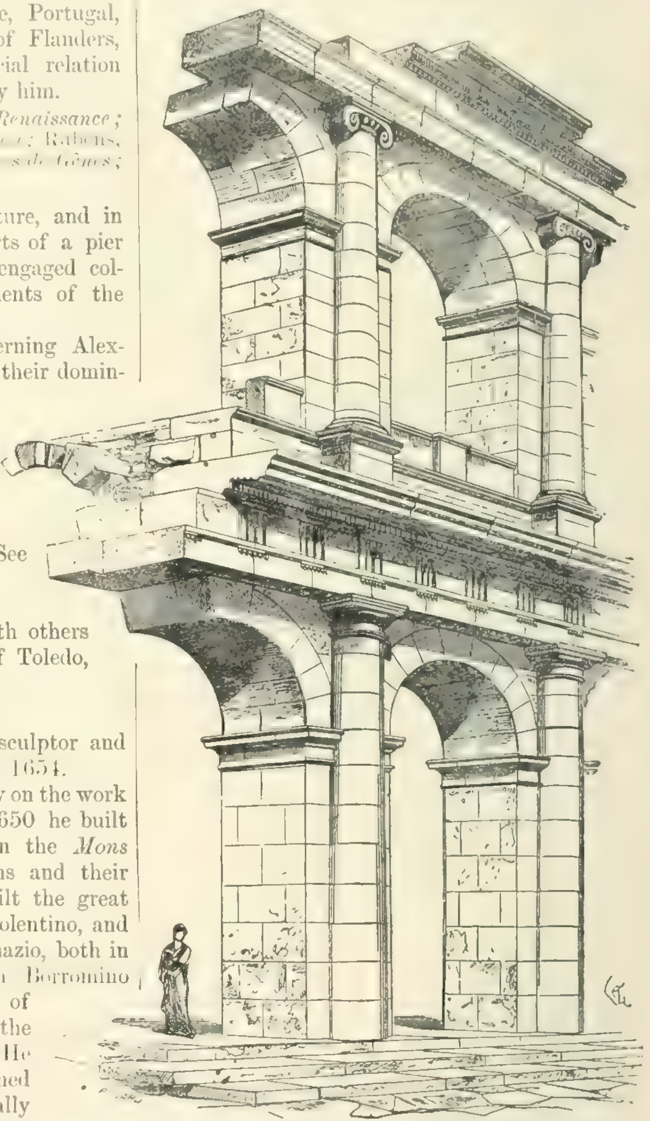
Algardi formed himself principally on the work of Bernini (see Bernini). After 1650 he built the Villa Belrespiro or Pamfili on the *Mons Janiculus,* Rome, with its gardens and their architectural decorations. He built the great altar of the Church of S. Niccolò Tolentino, and the façade of the Church of S. Ignazio, both in Rome. He was associated with Borromino (see Borromino) in the decoration of S. Peter's. Algardi was one of the best sculptors of his time. He worked in ivory and silver, designed gems and medals, and was especially successful in modelling children. His most characteristic work is the great bas-relief representing "Attila's retreat from Rome" at S. Peters.

Gurlitt, *Geschichte des Barockstiles in Italien;* Ebe, *Spät-Renaissance;* C. A. Platt, *Italian Gardens;* Percier et Fontaine, *Les Plus célèbres Maisons de Rome.*

ALGERIA, ARCHITECTURE OF. (See North Africa, Architecture of.)

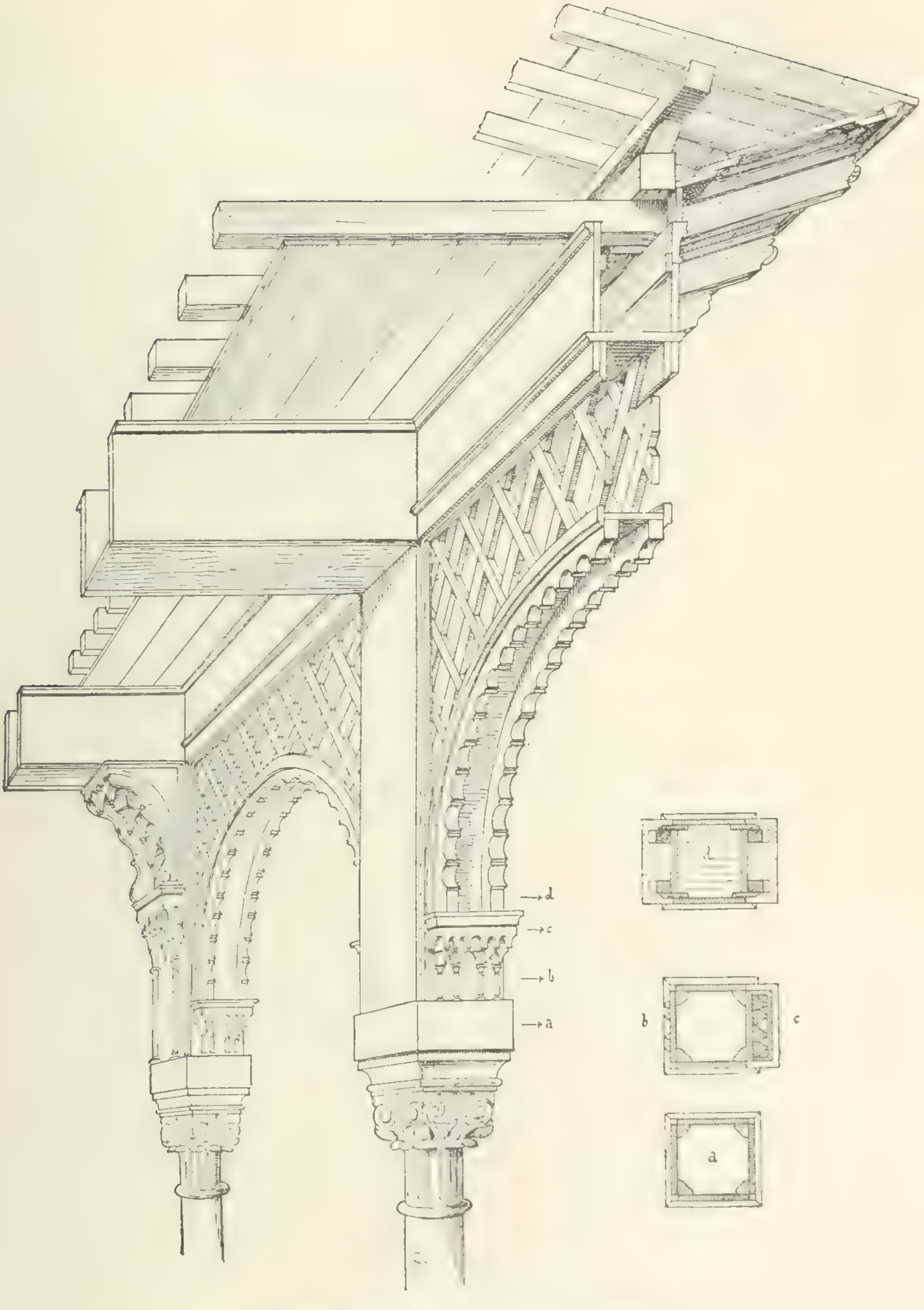
ALHACENA In Spanish architecture, a recess or niche. The name is applied to decorative niches used as cupboards, of which a very splendid one, formerly in Toledo and richly decorated with stucco reliefs, is in the South Kensington Museum.

ALHAMBRA. A group of buildings on a hill above the city of Granada in southern Spain, forming a fortress palace or alcazar of the Moorish kings of Andalusia. The unfinished palace of Charles V. adjoins the Moorish buildings. The celebrated decorations of the courts and rooms are partly in ceramic tiles, partly in moulded and painted plaster on a wooden framework. (Cuts, cols. 45, 46; 47, 48.)



ALETTE: THE WING OF THE PIER ON EITHER SIDE OF EACH ENGAGED COLUMN.

Restoration by Viollet-le-Duc of the Order of the Theatre of Marcellus at Rome. The Doric columns of the lower story are now known to have a base.



THE ALHAMBRA, GRANADA, SPAIN

Construction of the arcading, Court of the Lions

ALHAMBRA FROM THE SOUTHWEST.

ALHAMBRESQUE. Of the style followed in the decoration of the Alhambra; Moresque of this particular type.

ALIEN HOUSE; — PRIORY An establishment dependent upon a foreign monastery or convent; sometimes, a branch of the parent abbey, with monks, etc.; sometimes a mere lodging for the guardian or steward.

ALIGNMENT. Same as Alinement.

ALIGREEK. A meander; probably a corruption of the French words *à la Grecque*.

ALINEMENT. The disposing or arranging of anything so that it shall conform to a fixed line or curve; especially a street line. Thus, the arranging of stones in a prehistoric monument, as Stonehenge near Salisbury, or Carnac in Brittany, in determined circles and straight lines, or the placing of houses along a street so that their fronts shall reach and not overpass a fixed limit, are equally instances of alinement. In the case of a city street the alinement may be fixed by law, as where a certain projection of areas and steps upon the sidewalk is allowed, while the house fronts must not pass the line of the property; or it may be fixed by agreement, as where the house fronts of a whole block may be set back a certain number of feet from the property line in order to give wider areas or courtyards in front of the houses. In architectural designing the term is used somewhat vaguely for the employment of long straight lines carefully laid down for the placing of streets and avenues. Thus, it is said that in the building of Rome under Nero alinement was carefully considered. (In this latter sense compare Axis and En Axe under Axe, I.) In antiquity, a disposition for alinement seems to have prevailed in Syria, where the colonnaded streets of Antioch, Palmyra, and Gerasa are probably prototypes of Western avenues. The cities of the Middle Ages and of modern times have commonly grown up on the irregular footpaths and lanes made without care by the early settlers, and hence the irregularity of London city, the lower parts of New York, and more especially of the old cities of the continent of Europe. On the other hand, cities laid out in advance and built up rapidly, whether of the Middle Ages (see Bastide) or in the Western states of America, are usually built up on carefully alined streets, which also are set at right angles to each other, or, if at a different angle, with some definite purpose in view, as in the well-known plan of Washington city (see Street). The system of alinement tends towards easy policing and good sanitation; it may be doubted, however, whether there is not more chance for architectural effect in the irregularities of the older parts of Hanover, Munich, Bergamo, and Paris, than in the straight-drawn avenues of the newer quarters. Written also Alignment.

R. S.

ALIPTERION. An anointing room in a Roman bath; called also *elaeothesium* and *unctuarium*.

ALLÉE. In French, an alley in the sense of the narrow passage between houses, or under a house; also, an avenue in the sense of a broad walk planted with trees, a promenade, or the like.

ALLÈGE. In French, a thinning or lightening of a part of a wall, as under a window, where the term covers the whole of the wall, usually much thinner, from the floor or the top of the opening below to the sill of the window above. There seems to be no English term for this; the inside of it forming the back or window back, and the exterior either remaining unmarked or constituting a sunken panel. (Compare Appui.) (Cut, col. 49.)

ALLEGHENY COUNTY COURT HOUSE. At Pittsburg, Pennsylvania. Built in 1888 from the designs of H. H. Richardson (see Richardson), in Romanesque style, with a tower three hundred and twenty feet high.

ALLEGORY. (See Symbology.)

ALLEGRI. ANTONIO, DA CORREGGIO. (See Correggio.)

ALLEY. A narrow passage way: (1) between two houses, like a very narrow street; (2) in or under a house, as affording passage directly to the inner court or yard, without entering the rooms of the house; (3) a walk in a garden; (4) an aisle, as in a church (obsolete); (5) an aisle in the modern sense, that is to say, a passage between the pews, more accurate in this sense than aisle; (6) a long and narrow building (see Bowling Alley). City houses have been built in many parts of the world, with alleys in sense (2) seriously modifying their plan; thus, in Boston, Massachusetts, the houses of about 1810–1840 had often alleys carried through them from street to back yard, and serving for the delivery of packages at the kitchen door in the rear; avoiding the necessity of front areas, which are costly to face with cut stone.

— R. S.

ALLEGE.

From a 5th-century building in Syria.

ALMARIOL; **ALMARIOLUM**; **ALMARY**. Same as Ambry.

ALMEMAR. A reading desk in a synagogue; that from which the law is read to the congregation. The term, of Arabic origin, is in use in the Jewish worship in many countries. In Spain and Portugal the same reading desk is called *Tebah*.

ALMENA. The curiously indented and generally trapezoidal battlement used in some buildings of the south and east of Europe; a Spanish term, probably of Arabic derivation. The Spanish word signifies also a turret or small tower, perhaps also a pinnacle, which uses do not seem to have been followed in English.

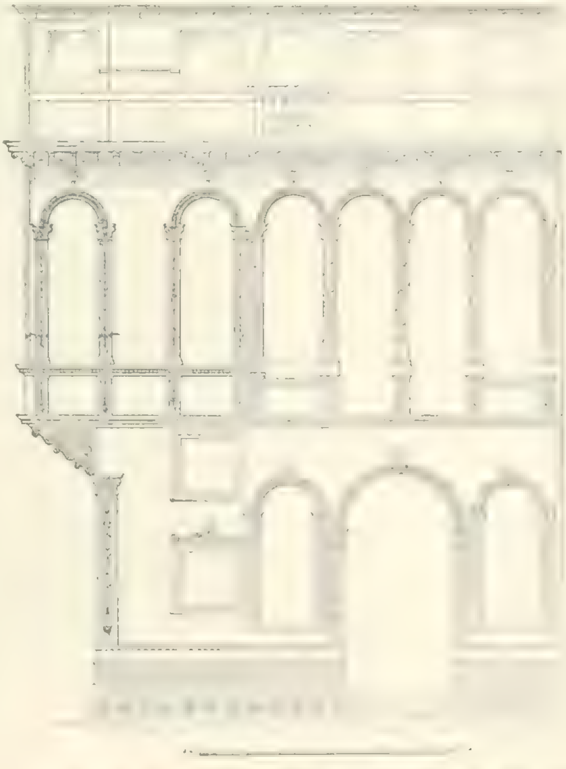
ALMERY. Same as Ambry.

ALMONRY. A place, sometimes a separate house, where the alms of a great abbey or of a city or a magnate were distributed. (See Almshouse, *B*.)

ALMS BOX — CHEST. A box or chest affixed to the wall, or standing on a pedestal, in a church, west of the pews or sometimes in the porch, and used to receive the offerings of the people for the poor. It is made of wood or metal, secured in place by screws from the inside, and provided with a strong lock; on the top or side there is a slit through which the money is deposited.— C. C.

ALMS GATE. In an abbey or manor house that gate in the bounding wall or courtyard wall where alms were distributed.

ALMSHOUSE. *A*. A building or group of buildings, for the reception of the poor and helpless. In England, the term is almost confined to establishments supported by private founda-



ALLEY: FRONT OF A HOUSE OF THE CLOSE OF THE 15TH CENTURY ON RIO DELLA FAVA, VENICE.

[illegible]

tion, and some of these have existed for many years, [illegible]. The workhouses kept up by different parishes are not considered as almshouses. The great Charter House, in London, is a very good instance of an almshouse which has existed in its present condition since the beginning of the seventeenth century, having been previously a Carthusian convent. It is here that Colonel Newcome, of Thackeray's novel, is supposed to have died. In the United States, the almshouse is usually an establishment supported by the state, county, or town for those who are incapable of self-support. (See Poorhouse.)

B. Anciently, in a great abbey, a house where poor travellers were received and alms distributed.—R. S.

ALOISIUS; architect.

An Italian architect of the sixth century who is mentioned in the letters of Cassiodorus as charged by Theodoric the Great with the reparation of the aqueducts, baths, and other works in Rome. He is supposed to have been associated with the architect Daniel (see Daniel) in the construction of the churches in Ravenna (Italy).

Quatremère de Quincy, *Dictionnaire d'Architecture.*

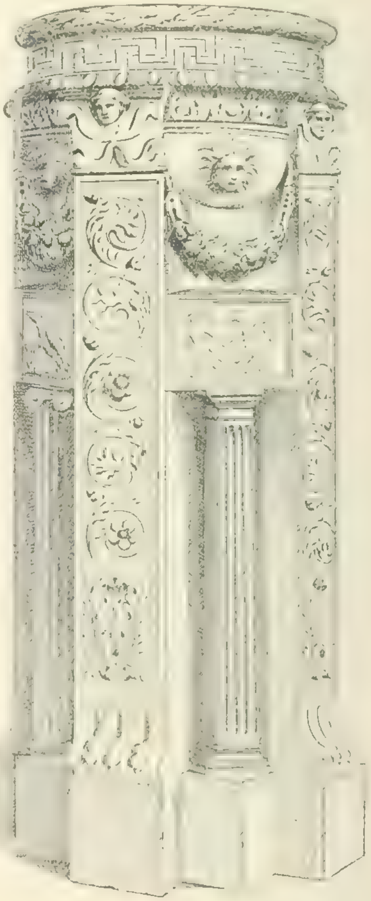
ALPHAND, JEAN CHARLES ADOLPHE; architect; b. Oct. 26, 1817; d. 1891.

In 1854 Alphand was called to Paris by Baron Haussmann (see Haussmann) as chief engineer of the promenades and plantations. He arranged the Bois de Boulogne, the Parc Monceau, the Bois de Vincennes, the Champs Élysées, the Avenue du Bois de Boulogne, the Buttes Chaumont and the Parc de Montsouris. He took a leading part in the organization of the Exposition of 1889. Alphand published *Les Promenades de Paris* (2 vols., folio, 1868–1873) and *Exposition universelle, 1889, Palais, jardins,* etc. (2 vols., folio, 1892).

Construction Moderne, Dec. 12, 1891.

ALSACE, ARCHITECTURE OF. (See Germany, Architecture of, Part. II.; The Rhine Country.)

ALTAR. Any raised structure with flat top intended for the offering of sacrifices, as to a deity, the *manes* of the dead, or the memory of a national or family hero. In antiquity, altars were sometimes composed of the ashes of previous burnt offerings piled together, dampened, perhaps with a view to more easy compacting of the mass, and constantly increasing in size. An altar might be composed of earth or rough stones, or a single stone could be dedicated for a special purpose. As the sacrifice was sometimes small and easy to handle, such as incense, cakes of bread, honey, or the like, altars might be very small. When animals were slaughtered only small parts of the larger creatures were actually consumed; still, as there always existed the idea of the gods enjoying the savour, and of men sharing in the feast of the gods by eating parts of the creature sacrificed, it remained essential to have some altars large enough to carry a fire of a certain intensity. Altars, therefore, were of all sizes, from a slender column about three feet high, with a flat top perhaps slightly sunk or dished, to structures several feet long. Altars for other sacrifices than that of incense were commonly in the open air, and sacrifice was offered, not within the temple, but in front of it, as a general rule. It would, however, be within the temenos or sacred enclosure.



ALTAR: GRÆCO-ROMAN WORK.

The altars of the Jews as recorded in the Old Testament did not essentially differ from those of pagan antiquity; as indeed the uses to which they were put were altogether similar.

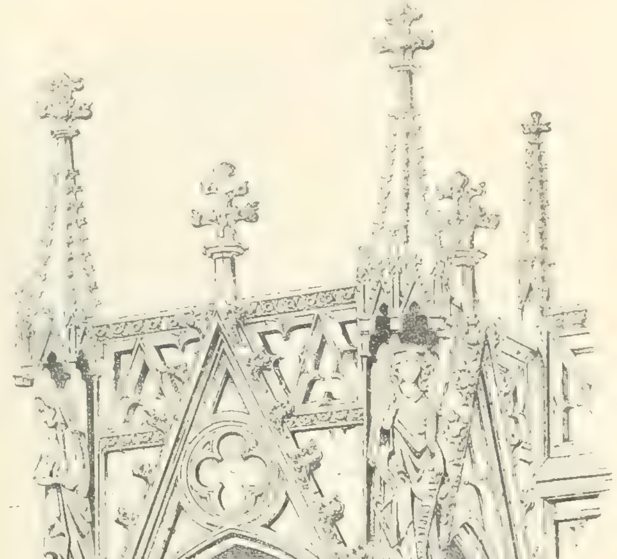
The Christian altar is a tablelike construction upon which the eucharistic sacrifice is offered. When fully developed it consists of a number of parts: a Mensa or table, a Predella or platform, a Ciborium or canopy, a Retable or steplike shelf, a Reredos or screen, and lastly a Tabernacle or *closet* for the Reservation.

The founders of Protestant Christianity, rejecting the doctrine of the sacrifice of the Mass, substituted a table in place of an altar. (See Communion Table.)

In the Primitive Church all altars, outside of those in the Catacombs, were made of wood, that is, until the time of Pope Evaristus (112 A.D.), who is said to have condemned their use, which prohibition was subsequently strengthened by Pope Sylvester (314–335 A.D.), and later on formulated by a Council of the Church. Throughout Western Christendom stone altars have been in use for ages, and even when wood or metal was employed the part of the altar on which the chalice and paten are placed was invariably made of stone. In some of the Oriental churches wooden altars are not unknown, although stone is the material of which they are usually built, except among the Copts, who sometimes employ brick. All of the first altars, both in the East and West, whether made of wood, stone, marble, or metal, were very simple, and consisted of a slab (mensa) resting on one or more legs, or on slabs at each end of the mensa, or on brackets projecting from a wall; but no matter how plain or precious they were, when in use they were covered with the finest linen and beautiful stuffs, ornamented with silk embroideries, studded with gems, and enriched with plates of gold and silver.

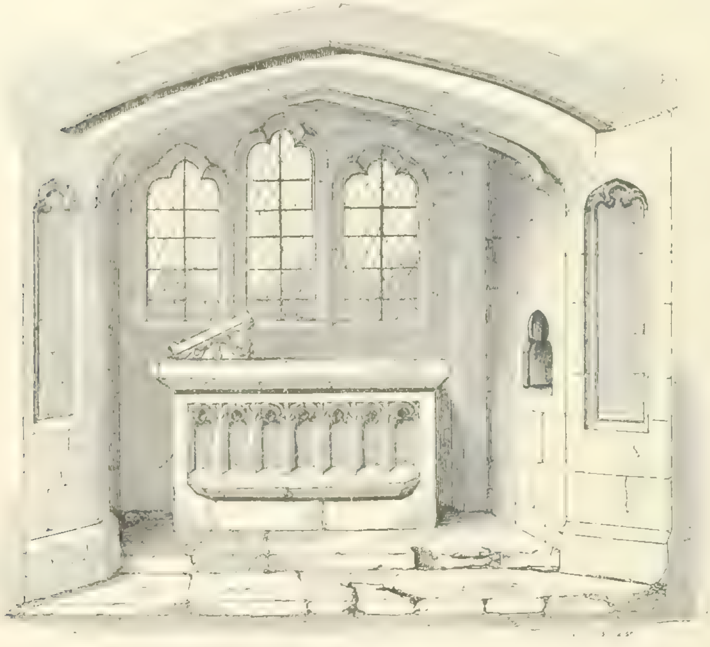
The various kinds of altars are distinguished one from another by specific names, such as High Altar, Side Altar, Shrine Altar (which see below) and portable altar. In the first days of the faith there was but one altar in each church, standing in the east end of the building, in the centre of the sanctuary between the east wall and the outer or west edge of the chancel platform. The altar always determined the orientation of the church irrespective of the true point of the compass. (See Basilica; Orientation.) As a rule it was built over a crypt containing the body of a saint or martyr, and was without retable or reredos, but very often it was covered with a ciborium, from which were hung curtains of silk. This arrangement of a primitive chancel and altar can be seen today in many churches in Italy, viz., S. Giovanni in Laterano; S. Clemente; S. Lorenzo at Rome and in the Ambrogian basilica at Milan.

In the course of time other altars were introduced beside the high altar, and after the sixth century a plurality of altars was the rule in the churches of Western Christendom and in some of the Eastern churches. These side altars were built in honour of some particular saint and were often highly decorated.



ALTAR WITH CANOPY, RATISBON CATHEDRAL.

The modern practice in building a high altar is to place it either well out toward the front of the sanctuary, or close to the east wall, but never attached to it; at least 2½ feet away, as this space is needed as a passage, not only at the time of consecration, but at all times for the convenience of the sacristan. The altar itself is built on a platform projecting not less than 4½ feet in front of the altar and at least 14 inches at the side; this predella or foot-pace corresponds in length with the mensa, plus 14 inches at either side, and should not be approached by less than two steps, with treads 12 inches to 2 feet wide and risers 4½ inches high. If there is a reason to raise the altar higher, more steps are added, but always an uneven number, and never more than nine. The table or mensa of the altar is rectangular in form, a single, natural stone, seldom less than 9 feet long and 2 feet wide, square at the edge, and supported upon stone piers, columns, a solid or hollow stone foundation, but never upon brackets, bricks, or artificial stone; these supports are covered with wood, stone, marble, mosaics, or metal, and ornamented in a manner consistent with an altar and in keeping with the style of architecture of the church (see Altar Front; Frontal); the mensa extends beyond its support, both at the front and sides, and on its upper surface five crosses are cut: one at each horn or corner and one in the centre, on the cover of a small square shallow cavity called a Sepulchre, a receptacle for relics; the height of the mensa above the foot-pace is 3 feet 5 inches. When the altar is very long the table is made of three slabs, but the centre one is alone the mensa, or in case the table is made of other material than stone or marble, there is inlaid in its body, midway between the south end (the Epistle side) and the north end (the Gospel side) (see Ambo) and at an equal distance from the back and front edge, a Superaltar of stone which is the true mensa. Where there is a retable it is either as long as or longer than the mensa, and is built at its back or east edge, but never encroaches upon the same.



Altar, Wenlock Priory, Shropshire, c. 1450.

A side altar is ruled by the same canons as a high altar, except that it is smaller and stands on a foot-pace without steps, with one gradine on the retable and no tabernacle, unless it is used as an altar for the Blessed Sacrament. If the sacrifice is to be offered on it, the mensa is the same as that of a high altar. A figure of its titular may be placed on the retable or painted on the reredos. When there are a number of side altars, the first in dignity is the one nearest the Gospel side of the high altar, and the next in rank is the one nearest on the Epistle side. (Cuts, cols. 57, 58, 59.)

(*La Messe: Études Archéologiques sur Les Monuments* par Ch. Rohault de Fleury, 8 vols., Paris, 1883; J. B. Thiers, *Dissertation sur les Principaux Autels, etc.*, Paris, 1688; Mgr. X. Barbier de Montault, *Construction de l'ameublement et de la décoration des Églises*, Paris, 1885; Caryl Coleman, "Christian Altars and their Accessories," *Architectural Record*, Vol. IV., New York, 1895; *The Gothic or English Altar, Transaction of the S. Paul's Ecclesiological Society*, Vol. III., London, 1894.)

— Caryl Coleman.

Byaltar. Same as Side Altar.

High Altar. That one which serves as the principal altar in a church, and at which the services on feast days, fast days, and the like, are conducted. In fully equipped churches this altar stands at the east end (see Orientation), and in the sanctuary beyond the choir.

Shrine Altar. One serving as a shrine or as a cover for a shrine; less often one upon which a shrine is erected.

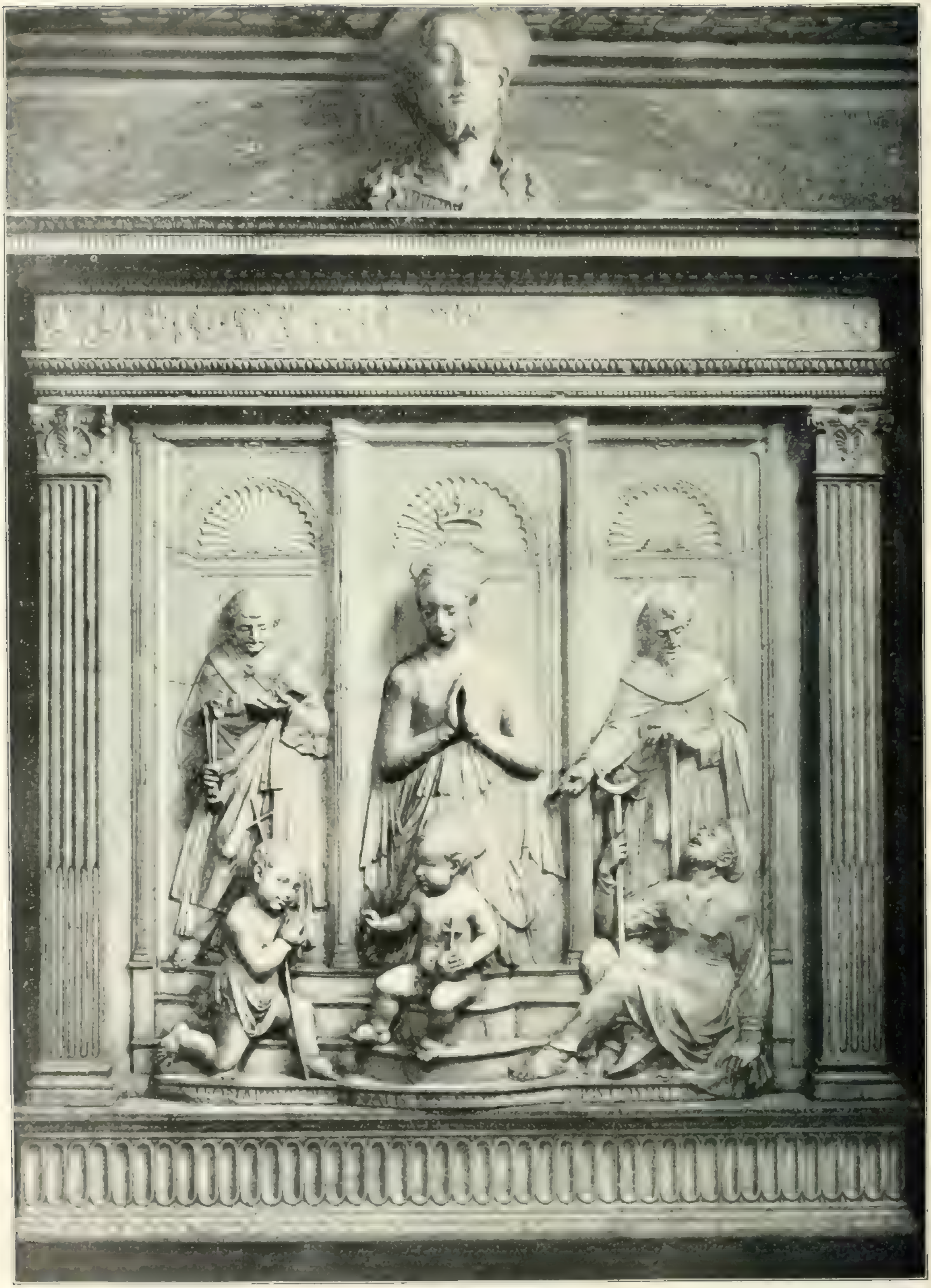
Side Altar. In a church, an altar subordinate to the central altar, often placed in a bay of the nave.

Superaltar. A portable altar in the form of a slab on which the elements may be consecrated elsewhere than on the altar proper. Being especially consecrated for this service, it was often laid upon a fixed altar which had not been so consecrated. It is sometimes incorrectly confounded with the Altar Ledge and Retable.

Votive Altar. An altar erected in fulfilment of a vow.

ALTAR OF AUGUSTUS. (See Pax Romana.)

ALTAR BOARD. In a Coptic church, a wooden panel ornamented with the cross and



ALTAR PIECE

In the cathedral of Fiesole, Tuscany; the work of Mino da Fiesole. The saints who accompany the Madonna are generally named, he on the left, S. Remigius (the S. Remi of the French), and he on the right, S. Leonard, a Frenchman, and one of the early devotees who left the world to devote himself to works of beneficence.

other symbols, and set into a depression in the top of the altar. The chalice and paten are placed upon it during the mass.

ALTAR CAVITY. A small chamber or recess in the body of an altar or immediately below it; used in some forms of Christian worship for the deposit, either permanently or at certain times, of objects connected with liturgical service. (See A. J. Butler's *Coptic Churches*, Vol. II.)

ALTAR DESK. A small desk set upon the altar to support the service book.

ALTAR OF EUMENES II. A large building of which traces remain among the ruins of Pergamon near the modern Pergama, on the western coast of Asia Minor. King Eumenes is thought to have built it between 180 and 160 B.C.. A great platform, raised 19 feet above the site and nearly 100 feet square, was faced by a retaining wall, upon which was sculptured the frieze, of which large fragments are now in Berlin, representing the battle of the gods of Olympus against the giants. On the west a flight of steps was carried through this retaining wall to the platform; in the middle of which was the altar of Zeus, while around it, on three sides, was an Ionic portico, whose original plan is not perfectly known. — R. S.

ALTAR FACING. Same as Altar Frontal.

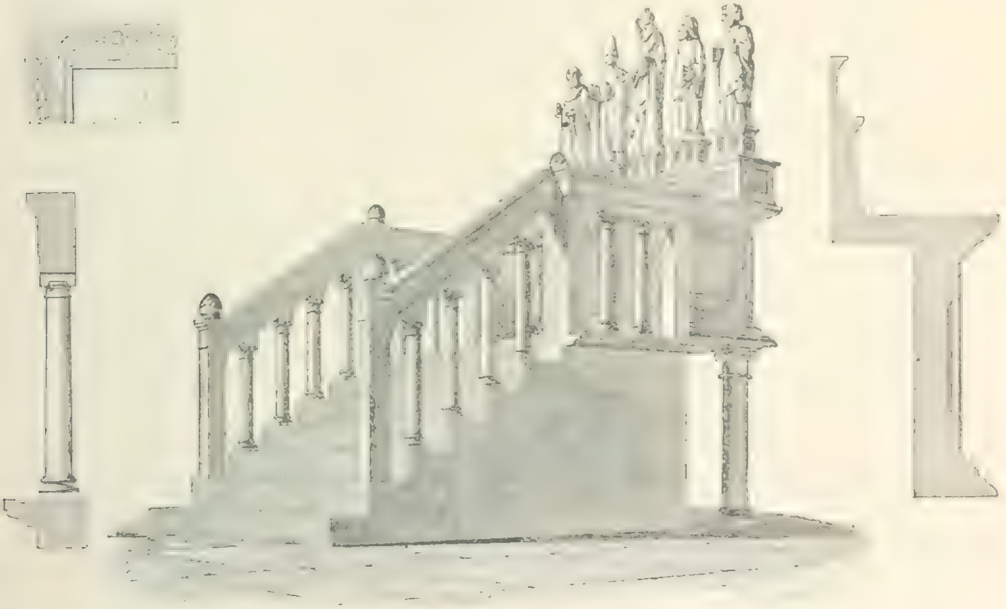
ALTAR FRONT; — FRONTAL. A hanging or panel used to form a movable front for an altar. The altars in some churches are of such splendour that frontals are rarely used, but in other cases a frontal is always in use, and there are sometimes many different frontals, which are changed according to the day. Silk of different colours strained on a frame and often richly embroidered is sometimes used; the colours varying, as white for the feast of a virgin saint, black on a fast day, and the like.

ALTAR HERSE. (See Hearse.)

ALTAR LEDGE. A step at the back of an altar forming a ledge or shelf slightly higher than the altar, to receive lights, flowers, or ornaments.

ALTAR MOUND. An American mound supporting what is supposed to have been an altar. Especially those mounds of the United States which contain something like an altar of burned clay, or stone. (See Mound.) — F. S. D.

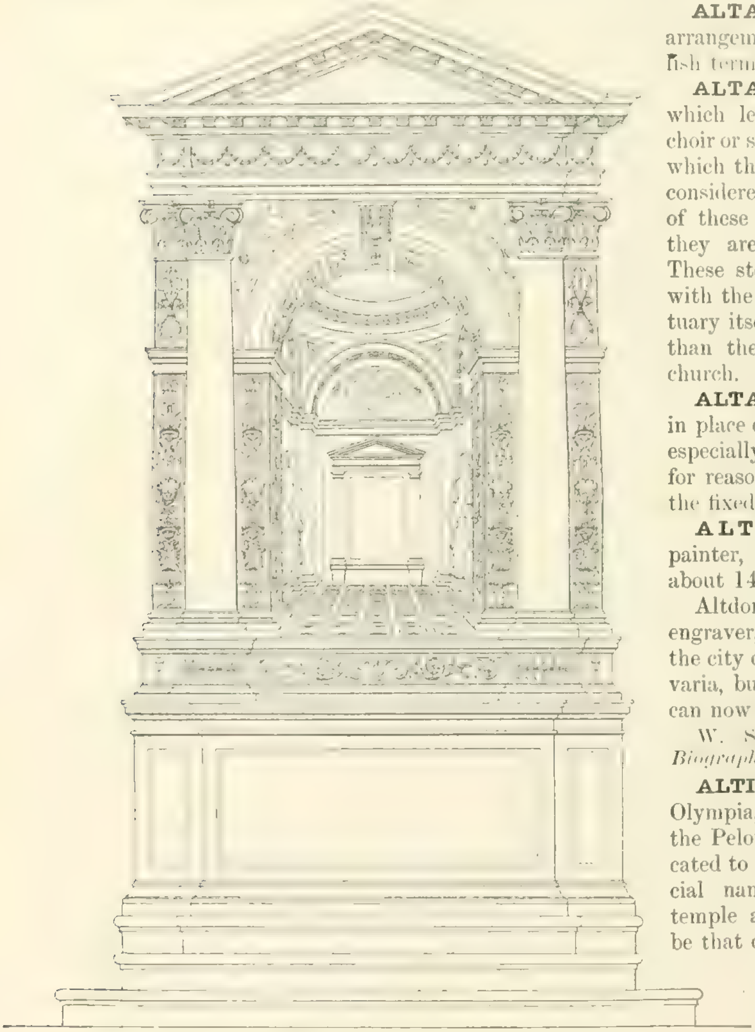
ALTARPIECE. The decorative screen or piece of wall facing, set behind and above an altar. This may be wholly detached from the wall of the church or chapel, so that both sides are exposed; and it is sometimes a separate structure raised on the floor of the sanctuary. In this case both sides may be richly adorned. In other cases, the picture or piece of wrought metal work, or the sculptured panel, may be set against the wall, as when the altar itself is so placed. In the later churches of the continent of Europe, the altarpiece is often simply an important painting in a richly designed frame, and the term is often applied to the picture, as when it is said that the finest Titian in Venice is an altarpiece. Some of the most magnificent compositions, in enamelled relief, of the Della Robbia family (see Robbia) are altarpieces, and even very small churches in the Apennines are furnished with these. The Pala d'Oro, in S.



Altar: S. Antonio at Padua: Italian Work, Late 14th Century.

Mark's Church at Venice, is an altarpiece. See Reredos; Retablo. — R. S.

ALTAR RAIL. The top bar of the railing or parapet in front of the altar or communion table separating the officiants from the worshippers; the railing or parapet itself. In early Christian churches it was usually a solid marble parapet; in modern practice it is of simple and open design of wood or metal, usually on metallic supports. (Cut. col. 62.) — A. D. F. H.



Altar of the Most Holy Sacrament: Church of SS. Gervasio e Protasio.

The whole is sculptured in marble; the effect of perspective in the middle being produced by shallow relief and intaglio.

ALTAR SCREEN. *A.* A screen higher than an ordinary railing or parapet, separating the altar from the presbytery, retrochoir, or other space behind it. (See Choir Screen and references.)

B. According to a common but incorrect usage, the Reredos; or even the choir screen in front of the chancel.

ALTAR SIDE. The part of the altar which faces the congregation. It is usually concealed or decorated by the altar frontal.

ALTAR SLAB. A flat stone or slab forming the top of an altar.

ALTAR STAIRS. The steps leading up to an altar.

ALTARSTEAD. The place and arrangement of an altar; an old English term not now in use.

ALTAR STEP. One of the steps which lead up from the floor of the choir or sanctuary to the platform upon which the altar stands. It is usually considered that there should be three of these steps, but in large churches they are frequently more numerous. These steps are not to be confounded with the flight leading up to the sanctuary itself in cases where it is higher than the neighbouring floors of the church.

ALTAR TABLE. A table used in place of or as representing an altar; especially a movable table substituted for reasons of doctrine or practice for the fixed and usually stone built altar.

ALTDORFER, ALBRECHT; painter, engraver, and architect; b. about 1480; d. about 1538.

Altdorfer, the famous painter and engraver, held the office of architect of the city of Ratisbon (Regensburg), Bavaria, but no buildings of importance can now be ascribed to him.

W. Schmidt, in *Allgemeine deutsche Biographie*.

ALTIS. The sacred enclosure at Olympia, near the western shores of the Peloponnesus. The site was dedicated to Zeus, who took from it a special name; thus the great Roman temple at Athens is properly said to be that of the Olympian Zeus.

ALTO RILIEVO. Carving or sculpture in high relief, standing out prominently from the background, as in the metope groups of the Parthenon.

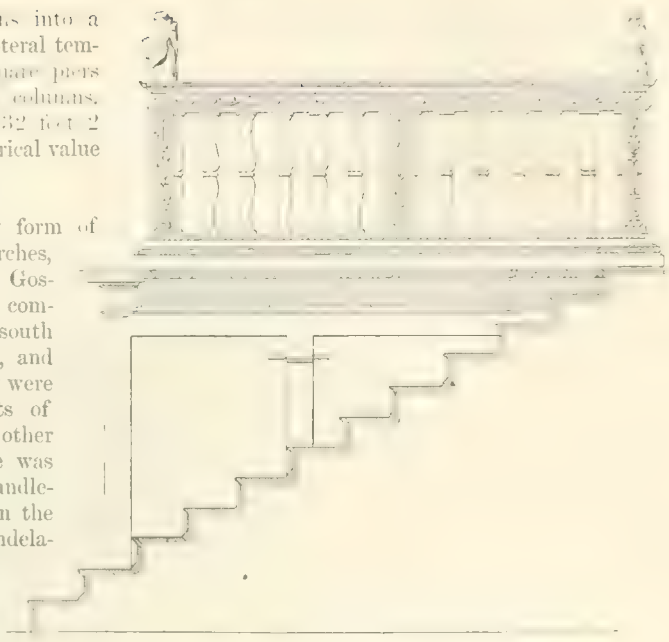
ALURE. A passage, or ambulatory, whether within a building or partly out of doors like the gallery running along a cloister. (Compare Ambulatory.) This old English term is written in different ways; as, aloring, and alourde.

ALVEATED. Having the general concave shape of a beehive; said of certain vaults or cupolas.

AMADAH. A small temple of the eighteenth Egyptian dynasty, near Derri in Nubia, converted by the Coptic Christians into a church. It is one of the few peripteral temples of Egypt, surrounded by square piers with a pronaos of four polygonal columns. It measures 71 feet 6 inches by 32 feet 2 inches. Inscriptions of great historical value remain.

AMADEO. (See Omodeo.)

AMBO; AMBON. An early form of Pulpit first used in basilican churches, whence the Lections, Epistle and Gospel, were chanted. There were commonly two in a church, one on the south side of the chancel for the Gospel, and on the north for the Epistle. They were usually provided with two flights of steps, one from the east and the other from the west. Very often there was attached to the Gospel ambo a candlestick, and during the Easter season the Paschal candle was placed in a candelabrum on its north side. Ambones were built of marble, enriched with glass mosaic, cosmati work, and inlays of various-coloured stones and marbles. Examples may be seen in the Roman churches of S. Clement and S. Mary in Cosmedin, at Ravenna, in the Church of S. Apollinare Nuovo, and in many other Italian basilicas.



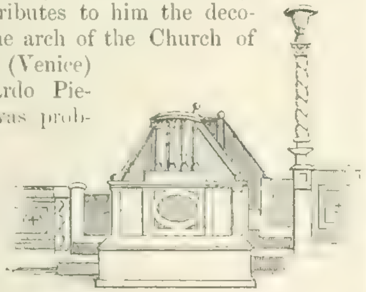
Altar Rail from S. M. dei Miracoli, Venice.

Martigny, *Dict. des Antiq. Chrét.*; Bunsen, *Die Basiliken des Christ. Roms.*; and *Revue de L'Art Chrétien*, Vol. 1887, p. 372; Vol. 1894, p. 77.

— Caryl Coleman.

AMBROGIO D'ANTONIO (da Urbino or da Milano); sculptor and architect.

Ambrogio da Urbino carved the decorations of the portal of the Church of S. Michele in Isola at Venice (see Mauro Coducci). Paoletti attributes to him the decorations of the arch of the Church of S. Giobbe (Venice) (see Lombardo Pietro). He was probably identical with the Ambrogio d'Antonio da Milano who, after 1470, carved the superb decorations of the palace of the Montefeltro at Urbino (see Laurana, Luciano da).



Ambo: Gospel Side; Church of S. Clement, Rome.

Paoletti, *Rinascimento in Venezia*; Sansovino, *Venetia*; Arnold, *Palast von Urbino*.

AMBRY. A storage place, a closet, a press, a storeroom, or storehouse; also a closed compartment in such a place. Specifically —

A. A place for keeping food, as a pantry or compartment in a pantry.

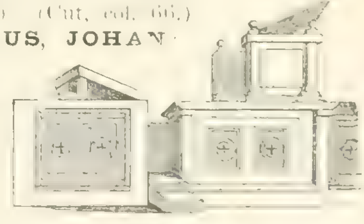
B. In the choir or sanctuary of a church, a cupboard in the wall, used for the keeping of the vessels of the communion service, or Mass, or for service books and the like. (Cut, col. 63.)

AMBULATORY. A passageway in, or connected with, a building, usually for persons on foot only. One of the covered walks of a cloister often receives this name. (Compare Alure.) (Cut, col. 66.)

AMELIUS, JOHAN

architect.

Amelius lived in the early fifteenth century, and was employed in the construction of the Cathedral of Antwerp, Belgium, which was begun in 1422 and finished in 1518.



Ambo: Epistle Side; Church Basilica of S. Clement, Rome.

Immerzeel, *Hollandsche en Vlaamsche Kunstschilders Beeldhouwers*, etc.

AMENOPHEIUM. A group of important buildings dedicated to or erected by the Egyptian king Amenhotep III., at Thebes on the west bank of the Nile. (See Egypt, Architecture of.)

AMERICA, ARCHITECTURE OF. (For that of North America see Canada; Mexico; United States. For that of South America, see under South. See also Central America; West Indies.)

AMERIND ARCHITECTURE; AMERINDIAN ARCHITECTURE. That of the red races of America. [illegible] Amerind [illegible]

Amerindian has been adopted by archeologists recently (1900) to replace the obviously inaccurate phrase "American Indian." (See Aboriginal American Architecture and the references there.—Ed.)

AMMANATI, BARTOLOMMEO; sculptor and architect; b. June 18, 1511, at Settignano, near Florence; d. April 14, 1592.

He began as a pupil of the sculptor Bandinelli, but afterward went to Jacopo Sansovino (see Sansovino, J.) in Venice, whom he assisted, with Cattaneo (see Cattaneo, D.), Alessandro Vittoria (see Vittoria, A.), and others, at the Library of S. Mark (which see). Returning to Florence, he formed his style on the Medici tombs by Michelangelo (see Buonarroti). Ammanati went to Rome during the reign of Paul III. (Pope, 1534–1549) and assisted Vignola and Vasari at the Villa di Papa Giulio (see Vignola and Vasari). Returning to Florence in 1557 and the service of the Duke Cosmo I. de' Medici (b. 1519, d. 1574), Bartolommeo made the fountains of Pratolino and Castello and the beautiful bridge of S. Trinità (Florence, 1567–70). In 1559 he won the commission for the fountain of Neptune in the Piazza della Signoria, Florence, in competition with Benvenuto Cellini (see Cellini), Gian Bologne (see Bologne), Vincenzo Danti, and Il Moschino. He built the garden façade of the Pitti palace, the second cloister of S. Spirito and the Palazzi Guigni, and Ramirez di Montalvo, in Florence. Ammanati began the immense ducal palace at Lucca, Italy, which was continued by Pini and Juvara (see Juvara). The Palazzo Micheletti in Lucca is also attributed to him.

Ambry; 14th Century; Church of Foulis, Perthshire, Scotland.

Muntz, *Renaissance*; Geymuller Stegmann, *Architektur der Renaissance in Toscana*; Ticozzi, *Lettere Pittoriche*; Raschdorff, *Toscana*.

AMMEISTER, HANS. (See Hans von Berckheim.)

AMMONIOS; architect.

According to an epigram of the anthology, Ammonios restored the celebrated Pharos (lighthouse) of Alexandria (Egypt), probably during the reign of the Emperor Anastasios (d. 491 A.D.).

Brunn, *Geschichte der griechischen Künstler*.

AMORTISSEMENT; AMORTIZEMENT. The sloping top of a buttress or projecting pier of any sort, usually built so that the rain water shall not injure the joints. (See Weathering.)

AMPHIPROSTYLE. Prostyle at each end; said especially of a Greek or Roman temple.

AMPHIPROSTYLOS. An amphiprostyle building (Vitruvius).

AMPHISTYLAR. Having columns on both sides or at both ends. (See Columnar Architecture.)

AMPHITHALAMUS. A chamber opposite the thalamus or chief bedchamber in an ancient Greek house, and separated from the thalamus only by a service corridor.

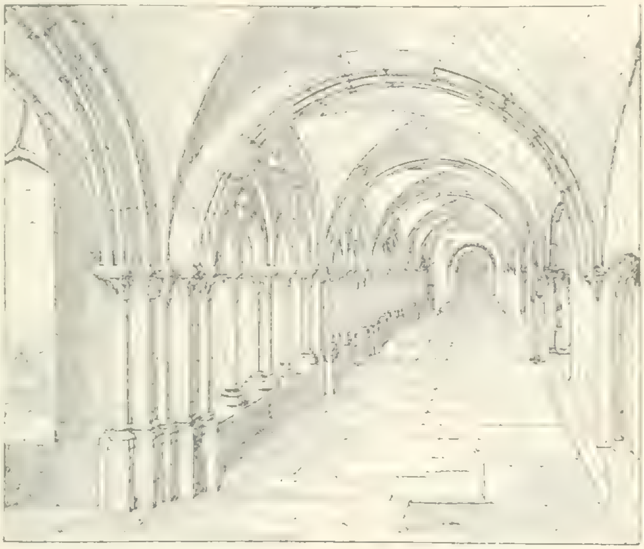
AMPHITHEATRE. *A.* In Roman antiquity, a building much like a double theatre, which its name suggests. Its main characteristic was that the seats of the spectators surrounded the place of exhibition, the arena. A wooden theatre built by Curio, the trusted officer of Julius Cæsar, was arranged so that two separate auditoriums could be swung round on pivots or wheels and either placed by themselves, each with its own audience, or brought together to form an amphitheatre. Wooden amphitheatres seem to have been numerous, and during the reigns of the earlier emperors several were destroyed by fire, or otherwise. The first stone one seems to have been built in the reign of Augustus.

Of the amphitheatres of which considerable remains exist, the largest is generally alleged to be the Flavian amphitheatre, although not at first wholly completed with the size and solidity which it reached later, at Rome; called also the Coliseum: and although others may have been somewhat larger in their outer circuit, apparently none contained so many spectators. The rows of seats of the Coliseum have generally disappeared, but the cross walls which supported them are partly in place, and the estimate of 87,000 seatings is not wholly unreasonable. The amphitheatre at Verona retains the stone seats; for these have been constantly used, the whole interior having been occupied by different performances throughout the Middle Ages and even in recent times. That at Pola, on the eastern coast of the Adriatic Sea, retains its exterior wall in great perfection. That at El Jemm, in Tunisia, seems to have been almost as large as the Coliseum, and this is thought to have been almost perfect down to the close of the seventeenth century, since which time it has been used continually as a fortress, and also as a quarry (see Tunisia, under North Africa, Architecture of). The amphitheatre at Capua seems to have been nearly as large as the last named and that at Tarragona, in Spain, still larger. Others in good preservation are at Arles and Nimes in the south of France, the two last being of almost exactly the same size. The one at Nimes has been carefully restored and retains many of its original features intact. There is also one at Pergamon, in Asia Minor, and one at Pompeii about as large as either of the two in France named above. It is notable that a town as small as Pompeii must always have been had an amphitheatre capable of holding perhaps 20,000 spectators.

The shows of the amphitheatre seem to have been generally combats of gladiators, though races to a limited extent were given there (see Circus), and naumachia, or sea fights, also. The combats of gladiators were with each other and with wild beasts, and the arrangement for the housing of these latter were very elaborate. The substructures of the Coliseum and of other amphitheatres have been explored of late years, and much is known of the dens, corridors, and movable cages by which the creatures were confined and brought to the surface. It is probable that, sometimes, large curtains were drawn across from wall to wall overhead, shading the seats of the spectators, if not also the arena.

The structural and economical problems attending one of these immense buildings were very considerable; thus, the drainage of the huge space, estimated at six acres, into which the rain fell freely, required an elaborate system of gutters and channels; and recent researches have revealed the existence of this system carried to a high degree of perfection. The vaulting, although simple in each part, is complicated when considered all together.

Architecturally speaking, the interior of a great amphitheatre could only have been of importance as a structure of vast size and as decorated with banners, applied sculpture, trophies, and the like, which formed no part of the building proper. The exterior would always have been, as was the case with buildings at all known to us, severely constructional, the radiating walls which supported the seats enclosing galleries which were vaulted overhead and which formed on the exterior open arches. The uppermost story alone seems, in the case of the Coliseum, to have been always a solid wall decorated with one of the very few systems of pilasters which has come down to us from antiquity. The great open arches below were probably adorned only by statuary placed beneath each arch, and perhaps a low wall or parapet raised above the sill of each opening. Exterior splendour was not much in the mind of the designer of one of these great buildings, as is evident from his willing acceptance of the very defective system of proportion which seems to have resulted from the necessities of the case.



Ambulatory of the Cloister: Abbey of Rommersdorf, near Neuwied, Germany.

B. In modern usage, the place for a large audience or a large part of an audience, the term being used according to whether the [illegible] of theatres and the like, as for an upper gallery in a large theatre where many persons can be accommodated, especially one in which the seats rise in steep slope, each row above that in front of it; also an outside building or [illegible] place for an audience.

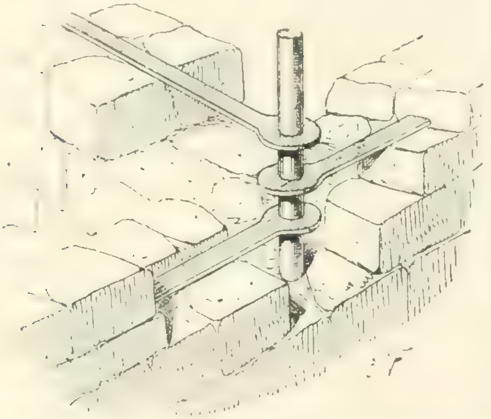
C. In ornamental gardening, a piece of ground enclosed with [illegible] growing shrubbery.

[illegible] shaped [illegible] These [illegible] have the appearance of [illegible] one above another. [illegible] mentioned [illegible] Roman [illegible] Architecture.
R. S.

Flavian Amphitheatre. Same as Coliseum; so called because built by the Flavian emperors, Vespasian and Titus.

AMPHITHURA. A curtain divided in the centre, closing the entrance through the iconostasis of a Greek church.

AMPHORA. An antique earthenware jar of considerable size, usually provided with two handles. The form varied greatly, from a somewhat full-bodied jar with wide mouth, to a long and slender jar with pointed bottom and large neck. Intended usually for wine or oil, they were used for a great variety of purposes, the largest being as much as 5 feet high.



Anchor without Ornamental Head, to secure Cross Wall or Partition to Exterior Wall, Three Steel Ribbons with Fixed Pin.

AMYGDALOID. A volcanic rock lava, containing almond-shaped cavities filled with secondary minerals. Example, the Brighton amygdaloid, near Boston. — G. P. M.

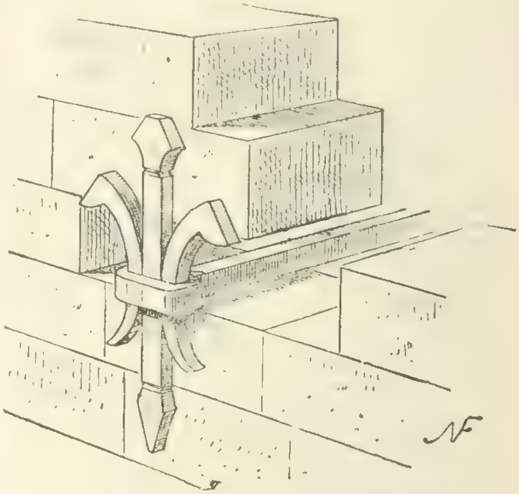
ANAGLYPH. A sculptured representation in relief, as distinguished from one in intaglio.

ANAGLYPHIC. Having the character of an anaglyph; carved in relief.

ANALOGION; ANALOGIUM. A reading desk, lectern, or ambo, or, in the modern Greek church, the cushion supporting the book upon such a desk.

ANATOMICAL THEATRE. A room fitted with seats for the demonstration to medical students of dissections, the giving of lectures with explanation of models, and the like. The need of bringing every student very close to the table, etc., has caused the elaboration of a scheme of seating, which has been used also in surgical theatres, in hospitals, and to a limited extent elsewhere. (See Medical College, under College, and Seating Capacity.)

ANCHOR (I.) A piece or connected pieces of metal for securing together more or less permanently two or more pieces of material or members of construction; used generally in connection with masonry. It may be comparatively small and simple, as a cramp or bent wire to connect two stones in a wall, or a large and important member, as a tie-rod passing through the opposite walls of a building and secured on the outside by means of plates and nuts. These outside plates are sometimes made very decorative; and in old houses in the Netherlands, in Belgium, and more rarely in other countries, the Arabic figures of the year of completion are given in four neighbouring anchor plates. (Cut, col. 69.)

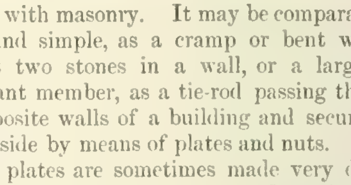


Anchor: 14th Century: Wrought-iron Fleur-de-lis for Head.

Ashlar Anchor. An anchor for securing parts of an ashlar facing to the backing. Its most usual form is that of a Cramp, a simple strap having the ends bent to be inserted in a joint or a hole cut for the purpose.

Beam Anchor. One for securing the end of a beam to a masonry wall, commonly a spur anchor.

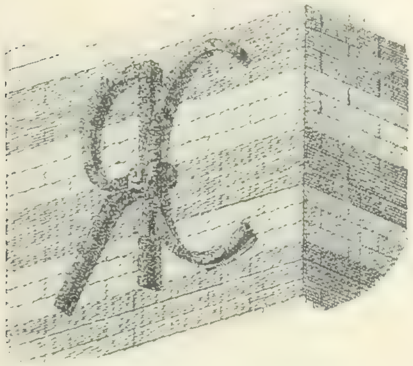
Spur Anchor. A T-shaped anchor formed of a strap, one end of which is bent around the middle of a rod at right angles to it. Used chiefly to secure floor beams and the like to masonry.



Four Anchors, the Heads giving the Date "1584."

Star Anchor. An anchor used as a tie rod, having a star-shaped head or plate on the face of a wall which is thus secured to other parts of the building.

Wall Anchor. One for tying parts of masonry work together; generally at the juncture of two walls. (Compare Bond.)



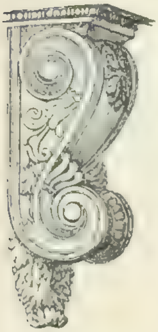
Anchor with Head, giving Cipher, "C. R."

ANCHOR (II.). Same as Dart in a decorative moulding. (See Anchor Dart; Egg and Dart.)

ANCHOR AND COLLAR. A form of hinge for a heavy gate or door, consisting of a ring or collar of metal attached to, or made with, an anchor, which is inserted into the masonry jamb, the collar serving as a socket for the reception of a Pintle, or of the Heel Post.

ANCHOR DART. The dart or pointed tongue between the oves of an egg and dart moulding. (See Egg and Dart.)

ANCON. (Pl. Ancones.) A console or scroll-shaped bracket, supporting the cornice or entablature over the aperture of a door or window in classic architecture. The most celebrated example is that of the doorway on the north side of the Erechtheion at Athens. Highly ornate ancones were used for the principal entrance to the Temple of the Sun at Baalbec. Vitruvius gives (IV. 6) precise rules for the proportions of the ancones, but these were not often observed in actual practice.



ANCONA. *A.* In Italian art, a picture with elaborate frame and setting, usually of architectural character; or a group of pictures, as when several minor paintings are attached in some way to a larger one. Thus, an Altarpiece consists often of a large painting with several much smaller in the predella, and the whole may be called an ancona.

B. By extension, a niche; a framed and architecturally important recess in which a bas-relief, or statue, or group may be placed.

ANDRÉ, LOUIS JULES; architect; b. 1819, at Paris; d. 1890.

André was educated at the École des Beaux Arts and won the *Grand Prix de Rome* in 1847. He held various important positions in Paris, and in 1884 replaced Lesueur (see Lesueur) as professor at the École des Beaux Arts.

Construction Moderne, Feb. 8, 1890.

ANDREA DA PISA (Andrea Pisano); sculptor and architect; b. 1270; d. 1349.

He received his training in Pisa, Italy, probably from Giovanni da Pisa (see Giovanni da Pisa). Before going to Florence Andrea worked in Venice, where he is supposed to have assisted in the decoration of the Church of S. Marco and the Doge's palace. The only work which can with certainty be ascribed to him is the first bronze door which was made for the Florentine Baptistery between 1330 and 1336. At the death of Giotto (see Giotto), in 1337, Andrea was appointed architect of the Campanile and built the two stories of niches above the work of Giotto. From 1347 to 1349 he was chief architect of the Cathedral of Orvieto (see Maitani, Lorenzo). The beautiful reliefs of the "Genesis" on the façade of that building are supposed to show his influence.

Marcel Reymond, *La Sculpture Florentine*; Lasinio, *Le Tre Porte del Battistero*; Nardini-Despotti-Mospignotti, *Il Campanile di Santa Maria del Fiore*.

ANDREA DEL SARTO; painter; b. 1486; d. 1531.

A mural painter of great ability and renown.

H. Janitschek, *Andrea del Sarto*; and, in the *General Bibliography*, Berenson; Crowe and Cavalcaselle; Vasari; Nagler; Bryan; [illegible] *Cyclopædia*.

ANDREA DI CIONE. (See Orcagna.)

ANDREA, MEISTER. (See Bregno, Andrea of Osteno.)

ANDREAS VON KEMPTEN; architect. He was one of the architects who drew up the statutes of organization of the German lodges in the reunion of architects and masons at Ratisbon (Regensburg), Bavaria, April 2[illegible] 1459. (See Dotzinger, Jost.)

Gérard, *Les Artistes de l'Alsace pendant le Moyen Âge*.

ANDRON. *A.* In Greek archæology, that part of a dwelling house which was used by the men of the household as distinguished from the gynæconitis. (See Gynæconitis; House; Megaron.)

B. In Roman archæology, a passageway in a dwelling. Vitruvius VI., 10, where the author says that the passage ways between the peristyles and the lodging rooms are called andrones, and that this seems an improper term.

ANDRONICUS OF CYRRHUS (either in Syria or Macedonia).

According to Varro and Vitruvius, Andronicus built or caused to be built, about 150 B.C., the so-called Tower of the Winds at Athens, which is still preserved. It is not known whether he was actually the architect or simply the donor or patron of the building. A similar building was erected in Rome by Scipio Nasica, probably at about the same time.

Brunn, *Geschichte der griechischen Künstler;* Stuart and Revett, *Antiquities of Athens; Vitruvius,* ed. Marini.

ANDRONITIS. Same as Andron.

ANDROSPHINX. An Egyptian sphinx of the kind which combines the head of a man with a lion's body.

ANDROUET (called du Cerceau) **BAPTISTE**; architect; b. between 1544 and 1547; d. before March, 1602.

Baptiste is supposed to have been the son, probably the oldest, of Jacques (I.) Androuet du Cerceau (see Androuet du Cerceau, Jacques, I.). A document of 1577 mentions him as "architecte à Charleval," where it is supposed that his father was then at work. After the death of Pierre Lescot (see Lescot, P.) in 1578, Baptiste succeeded him in the superintendence of the royal buildings in Paris, especially the Louvre. He probably continued the work on the southern side of the great quadrangle. In May, 1578, "un jeune du Cerceau architecte du Roi," probably Baptiste, began the construction of the Pont Neuf (Paris). In 1582, Baptiste succeeded Jean Bullant (see Bullant, J.) as architect of the chapel of the Valois at Saint-Denis, near Paris. For the King of Navarre, afterward Henri IV., he fortified the towns of Melun and Pontoise (France).

Von Geymüller, *Les du Cerceau;* Berty, *Topographie historique du vieux Paris.*

ANDROUET (Endrouet) (called du Cerceau) **JACQUES** (**I.**); architect and engraver; b. between 1510 and 1515; d. after 1584.

Founder and chief of an important family of French architects. The surname du Cerceau came from the *cerceau* or circle which served as a sign over the door of his atelier. It became inseparable from his name, and was afterward used as a title, his descendants being called Sieurs du Cerceau. Although a leader in the propaganda of the Italian Renaissance in France, the only evidence that he studied in Italy is in the character of his works, and especially of certain drawings in the royal library of Munich which are ascribed to him. The only building which can be attributed to him with certainty is the choir of the little Church of Montargis, France. He is supposed to have built parts of the châteaux of Montargis, Verneuil, and Charleval, all destroyed. He is known only by his books on architectural subjects and his splendid engravings. The large number of drawings and engravings attributed to him have been catalogued by Von Geymüller, (op. cit. p. 105). His principal books are: *Recueil de Vingt-cinq Arcs de Triomphe,* Aureliæ (Orléans), 1549, folio, 25 pl.; *Liber de eo pictura genere quod grottesche vocant Itali,* Aureliæ, 1550, folio, 25 pl., dedicated to Renée de France; reprinted by Wechel in 1566, with the title *Livre de Grotesques; Livre d'architecture de Jacques Androuet du Cerceau contenant les plans et dessaigns de cinquante Bastimens tous differens,* etc., Paris, Benoist Prévost, 1559, folio, 50 pl.; dedicated to the king; *Leçons de perspective positive,* Paris, Mamert-Pattison, 1576, small folio, 60 pl., 12 pp. text, dedicated to Catherine de' Medici; *Le premier volume des plus excellens Bastimens de France,* Paris, 1576, folio; dedicated to Catherine de' Medici; *Le second volume des plus excellens Bastimens de France,* Paris, Gilles Beys, 1579, folio; also dedicated to Catherine de' Medici. (These two volumes compose the most important of Jacques Androuet's works. As many of the buildings represented in them have been destroyed or mutilated, its historical interest is very great); *Livre des édifices antiques Romains,* 1584, folio, 63 pl.; dedicated to the Duke of Nemours.

Von Geymüller, *Les du Cerceau;* Berty, *Les grands architectes françois;* Palustre, *Renaissance en France.*

ANDROUET (called du Cerceau), **JACQUES** (**II.**); architect; d. September, 1614.

A son of Jacques (I.) Androuet du Cerceau (see Androuet du Cerceau, Jacques I). Jacques (II.) first appears in the accounts of François d' Alençon in 1577 as an attaché of that duke. In March, 1595, he was charged with the superintendence of the construction of the Louvre and the other royal palaces. It has been assumed that he designed and constructed that portion of the long gallery of the Louvre which lies between the Pavillon Lesdiguière and the Pavillon de Flore, the Pavillon de Flore itself (remodelled under Napoleon III.), and that portion of the Tuileries which stood between the Pavillon de Flore and the pavilion built by Jean Bullant (see Bullant, Jean). There is no proof of this. The work may have been done by Etienne de Perac (see Perac, E. de).

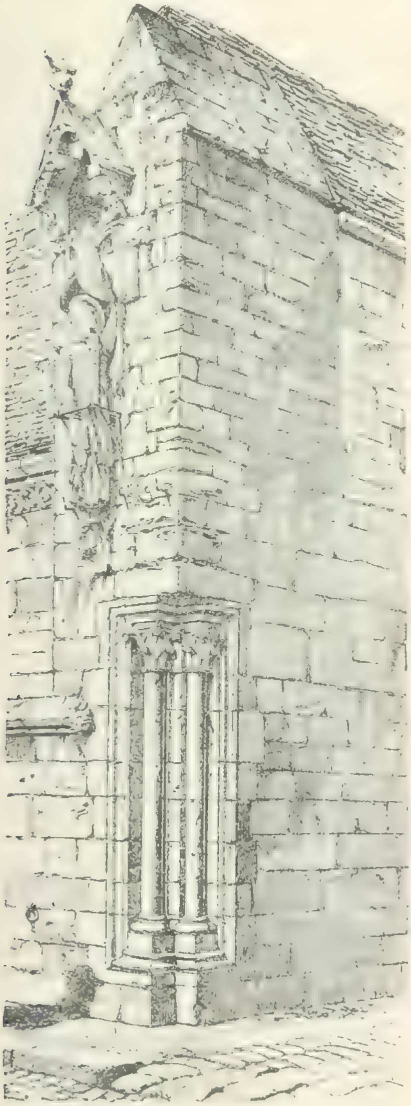
Von Geymüller, *Les du Cerceau;* Berty, *Topographie historique du vieux Paris;* Berty, *Les Grands architectes français.*

ANDROUET (called du Cerceau), **JEAN**; architect; b. before 1600; d. after 1649.

Jean was a son of Baptiste Androuet (see Androuet du Cerceau, B.). In 1639 he undertook with Denis Laud and Mathurin du Ry the reconstruction of the Pont-au-Change (Paris), the accounts of which, to 1642, are still in the library of the Arsenal. He built also in Paris the Hotels de Sully, de Bretonvilliers, and de Bellegarde. He is last mentioned in 1649.

Von Geymuller, *Les du Cerceau*; Berty, *Topographie historique du vieux Paris*; Berty, *Les grands architectes français*.

ANGEL LIGHT. A small triangular light between the subordinate arches of the tracery of a window, especially in the English Perpendicular style.



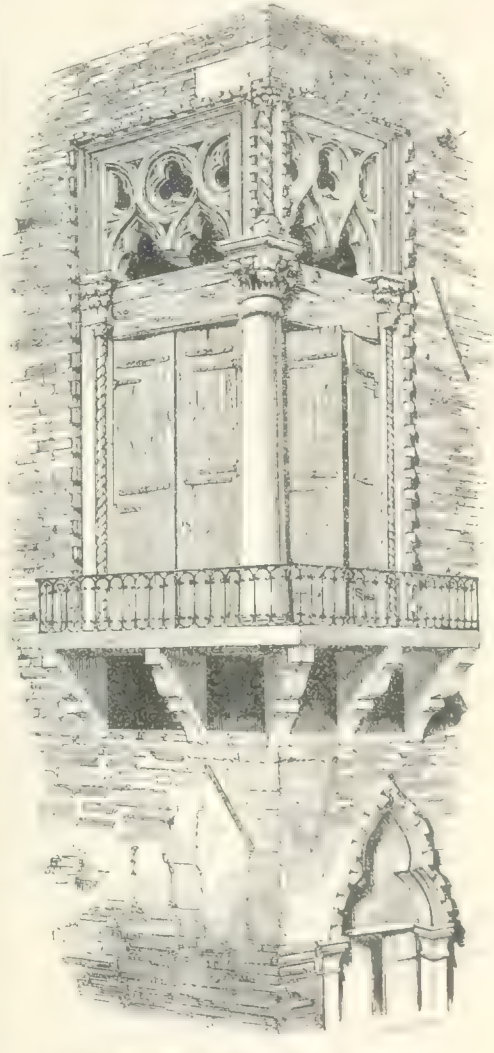
Angle Shaft: Curious Group of Two Shafts. French, 15th Century.

ANGLE BAR; ANGLE BEAD; etc. (See under Bar, Bead, etc.)

ANGLE BLOCK. A block employed in or at the angle of a structure; specifically, in a truss, a block or shoe, often of cast iron, at the junction of several members, as of a chord and a strut meeting at an oblique angle; in this case it forms an abutment for the strut.

ANGLE BRACKET. A bracket employed in or for a corner or angle; specifically, one which is set in a reëntrant or at a salient angle of a wall, in the plane which bisects the angle of the corner.

ANGLE CAPITAL. A capital at the corner of a colonnade or other structure. In the Ionic order the dissimilarity between the front and side of the ordinary capital occasions difficulties at the corners, which are overcome in various ways. Usually both of the outwardly visible faces are treated with volutes, which, at the external angle, are splayed outward at 45°. (See Ionic Order.)



Angle Shaft: Venice, 14th Century.

[illegible]

ANGLE IRON. A bar of iron or steel, in section composed of two "legs" joined by one edge of each, forming the shape of the letter L.

[illegible] construction, either alone or combined with plates of the same metal, to form columns, beams, etc. (See Iron Construction.) — W. R. H.

ANGLE LEAF. Same as Spur, C.

ANGLE MODILLION. A modillion at [illegible] (See Angle Bracket, of [illegible])

ANGLE SHAFT. A decorative member at one of the greater angles of a building, usually a moulding circular in general section, but often twisted or decorated with a spiral band and furnished with rings at the different belt courses, string courses, etc., and sometimes having capitals at intervals, so as to divide it into a series of columns corresponding to the stories of the exterior. A well-known example is that of the Ducal Palace at Venice, and other Venetian palaces are similarly adorned. (Compare Angle Staff under Staff, *B*, which is the term used for small interior members of this kind.) (Cuts, cols. 73, 74.)

ANGLE STAFF. Same as Angle Bar. (See Staff, *B*.)

ANGLE STONE. Same as Quoin.

ANGLE TIE. Same as Angle Brace (which see under Brace).

ANGLO-SAXON ARCHITECTURE. (See Saxon Architecture, *B*.)

ANGO, RICHARD. (See Ango, Roger.)

ANGO (ANGOT), ROGER; architect; d. 1509.

In 1475 Roger succeeded his father, Richard, as architect of the city of Rouen with the title *Maître des ouvrages et réparations du domaine de la ville de Rouen*. His name, with that of Roulland Leroux (see Leroux, R.), appears upon the records of the Palais de Justice at Rouen.

De Stabenrath, *Le Palais de justice de Rouen*; De Jolimont, *Les principaux édifices de la ville de Rouen*; Bauchal, *Dictionnaire*.

ANGOT. (See Ango.)

ANGUIER, FRANÇOIS; sculptor and architect; d. Aug. 8, 1669.

He was made by Louis XIII. custodian of the antiques, with apartments in the Louvre. His chief work is the monument which he erected to Henry II., Duc de Montmorency, in the chapel of the Convent of the Visitation at Moulins. He was assisted by his brother Michel (see Anguier, Michel) and the famous sculptor Nicolas Coustou (see Coustou, N.). He was employed to finish the sculpture of the Porte S. Denis (Paris) designed by the architect François Blondel (see Blondel, Fr.).

L. Duplais, *Étude sur les Anguier*; Bauchal, *Dictionnaire*.

ANGUIER, MICHEL; sculptor; b. 1614 at Eu, France; d. July 12, 1686.

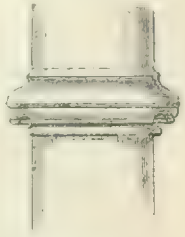
A brother of François Anguier (see Anguier, F.) and pupil of Simon Guillain in Paris and of Alessandro Algardi (see Algardi) in Rome. He remained ten years in Rome, and worked on the decorations of S. Peter's, the Church of S. Giovanni dei Fiorentini, and several palaces. He assisted his brother in many of his undertakings. Michel made four of the six twisted columns of the high altar of the Church of Val-de-Grâce (Paris) and the group of the "Nativity" in the same church.

Duplais, *Les Anguier*.

ANGULAR CAPITAL. Same as Angle Capital, the term being in common use but obviously incorrect.

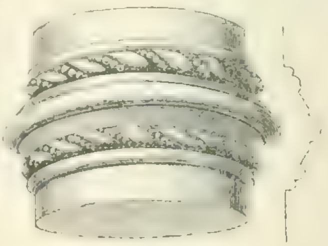
ANNEX. A supplementary building, added to, or used in connection with, an already existing structure; as an annex to a hotel. (For the specifically architectural significance of the word, see Pavilion; Wing.) Porches and the like of entirely subsidiary use are not considered annexes.

ANNULAR. Ring-shaped; especially applied to a Vault of which two forms are called annular.



Annulated Column from Whitby Abbey, Yorkshire.

ANNULATED. Fitted or furnished with a ring or rings; thus an Annulated Column is one fitted with rings or the appearance of rings around its shaft. In mediaeval work such columns are not unusual. Sometimes the shaft is composed of two cylindrical pieces, and between them is set a comparatively thin and flat stone of which the edge projects and is worked into mouldings, or sculptured. Sometimes the shaft is held in its place by a thin ring of metal, and this, or the stone plate above described, may be firmly built into a wall or pier.



Annulated Column from Church of S. Peter, Northampton.

ANNULET; ANNULUS. A small moulding or ridge forming a ring; especially one of the projecting rings at the base of the Grecian Doric capital. (See Capital.) The form annulus is rare.

Annulets at Necking of Grecian Doric Capital.

ANNUNCIATOR. An instrument used to indicate which of many bell handles or bell buttons has been used, as when a bell is heard to ring in a hotel. Sometimes, also, including a dial, or similar contrivance, to indicate the name of the article wanted by the person ringing. Before the general introduction of electric apparatus several simple devices were in use.

In an electrical annunciator there is, in connection with each needle or drop, a small electro-magnet. When a signal is sent an electric current comes over the circuit and passes round one of the small magnets, which then attracts a bit of iron that causes the drop or needle to change its position and indicate the place from which the signal has come. The drop or needle continues to indicate when it has once changed its position, even though the signal is momentary; but it can be set in the normal position again by pushing the button or moving the lever that is provided for this purpose. Annunciators differ in size according to the number of places to be indicated, and may contain hundreds of drops, as in a large hotel.

ANS, MEASE; architect and sculptor.

Ans was a German who practised in Zaragoza, Spain, in the second half of the fifteenth century. In 1477 he completed the splendid retable of the Cathedral de la Seo, at Zaragoza.

Viñaza, *Adiciones al Diccionario Historico.*

ANSE-DE-PANIER. Same as Basket Handle (adjectival term). (See under Arch.)

ANSTÉE; architect; d. 960.

Anstée, archdeacon of the Cathedral of Metz, Lothringen, Germany, is supposed to have been architect of the first cathedral building. He became *abbé* of Gorze in 945.

Bauchal, *Dictionnaire*; Lance, *Dictionnaire*.

ANTA. (The plural *antæ* is much more common.) A square or rectangular pier formed by the thickening of a wall at its extremity. In early Greek buildings, the porch was commonly made by carrying the side walls out to a certain distance beyond the front wall which contained the door of entrance, thickening the ends of these two walls, and placing columns between the two antæ thus formed (see Antis). The three sides of the anta may be of the same width, or that forming the face may be much wider than the two in return which flank it. The anta in Greek work has commonly a capital and base, and the ornaments of these differ very widely from those of the columns forming part of the same order. — R. S.

ANTE (adj.). Before, in front of, preceding; used generally in compound terms. Of most of these the meaning is obvious.

ANTECABINET. A reception room preceding the cabinet or private audience room of a prince or official, and usually furnished with considerable elegance. (See Antechamber; Anteroom.)

ANTECHAMBER. Originally, the room preceding or leading to the bedchamber of a royal or highly placed official personage. As the bedroom was more commonly used for reception and ceremony than now, the antechamber was a place of importance, and large enough to hold many visitors. In modern usage, any waiting room, lobby, or anteroom giving access to another.

ANTECHOIR. A reserved space more or less enclosed, in front of a choir; especially the space between the inner and outer gates of the choir screen.

ANTEFIX. In classic architecture, an ornament concealing the foot of the row of convex tiles which cover the joints of flat tiles (see Ridge Tile under Tile). The antefixes are thus a sort of widely spaced upright tablets forming a cresting along the lateral cornices of a gabled structure, taking the place of a cymatium. In Greek architecture, they were a feature of the Doric order especially, and were usually of anthemion form. In the older and less important buildings, both Greek and Etruscan, they were painted terra-cotta; in more elaborate structures, of marble.

ANTELAMI, BENEDETTO; sculptor.

The most important Italian sculptor before Niccolò da Pisa (see Niccolò da Pisa). In the latter part of the twelfth century he made the three portals of the Baptistery of Parma in the style of the French work of the time and introduced the motive of the Last Judgment in a tympanum for the first time in Italy. The sculpture of the Cathedral of Borgo S. Donnino is ascribed to him by Toschi, op. cit.

G. B. Toschi, "Le Sculture di Benedetto Antelami a Borgo San Donnino" in *Arch. Storico dell' Arte*, 1888, p. 14; Reymond, *Sculpture Florentine*.

ANTENAVE. A narthex or porch of any description leading into the nave, and preceding it on the side farthest from the altar.

ANTEPENDIUM. A hanging used for the front of an altar. (See Altar; Altar Frontal.)

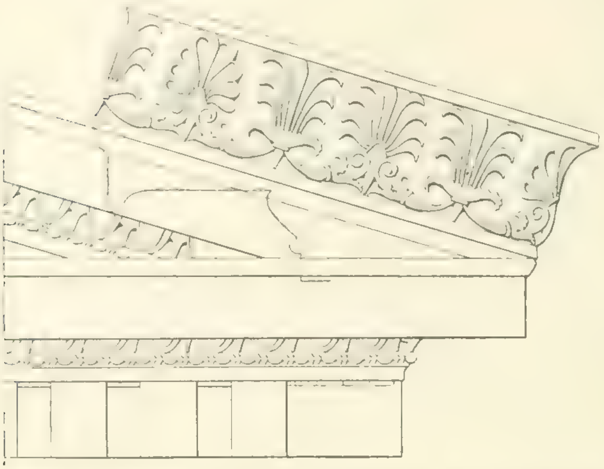
ANTEPORTICO. A portico preceding the main portico, as where an outer portico precedes a pronaos.

ANTEROOM. *A.* Any room preceding, or serving as a lobby or means of access to another and more important room.

B. More particularly, in English usage, a subordinate room, or one of several such rooms intervening between the entrance hall and a important room or suite. (See Antecabinet; Antechamber.)

ANTHEMION. *A.* In Greek art, a flat decorative group of flower or leaf forms having the general character of a radiating cluster of blossoms of the same plant, and hence often called honeysuckle ornament. There are three or four types of the Greek anthemion, constantly repeated in marble relief sculpture, in bronze, engraved upon metal, or painted upon vases; two of these types are often used in alternation. (See Anthemion Band; Moulding.)

B. In certain schools of art, a flat cluster, bouquet, or group such as can be inlaid or painted or carved in low relief, and varying widely according to the ornamentation common in different styles. In this sense the term is somewhat vague; but the characteristics of flatness and of radiation combined with floral forms are universal.



ANTHEMIONS CARVED UPON THE CYMATIUM OF THE RAKING CORNICE ABOVE THE PEDIMENT OF A TEMPLE.

There are three patterns, combining to form an anthemion moulding of unusual richness.

ANTHEMION BAND; MOULDING. A moulding adorned with anthemions, painted or carved. It is characteristic of classic and neoclassic architecture. In Greek architecture it was either a cyma recta crowning a cornice or was chiefly employed as a cymatium in the Ionic order, or, in the same order, a band under the volutes of a capital. Early examples in terra cotta are painted with anthemions imitated from pottery decorations, showing the origin of the motive.

ANTHEMIUS OF TRALLES; architect.

The pre-Justinian Church of Aya Sophia in Constantinople was burned Jan. 15, 532 A.D. The work of reconstruction was begun Feb. 23 of the same year, and the new building was dedicated Dec. 26, 537, in the eleventh year of the reign of the Emperor Justinian (b. 483; d. 565). In the cited work of Procopius published about 558 or 559 it is stated that Anthemius of Tralles, the most skilful master of his time, prepared the models for this building. Associated with him was the architect Isidorus of Miletus.

Procopius, *De Ædificiis Justiniani*; Procopius, *On the Buildings of Justinian*; Lethaby and Swainson, *Sancta Sophia*; Salzenberg, *Baudenkmäler von Constantinopel.*

ANTHON, GEORGE DAVID; architect; b. 1714; d. Aug. 30, 1781.

Anthon studied under Eigtved (see Eigtved). Sept. 30, 1751, he was appointed royal inspector of buildings and in 1748 professor of architecture in the academy at Copenhagen. In 1760 he was appointed royal architect. Anthon built the German Frederiks church at Christianshaven partly from the designs of Eigtved (begun 1755, finished 1769). He published *Anvisning til den civile Bygningskunst* (Danish and German; folio, 1759).

Weilbach, *Nyt Dansk Kunstner Lexikon.*

ANTHON; a sculptor, probably a Netherlander, employed on the Otto-Heinrichs Bau in Heidelberg (Baden, Germany,) in 1563. In the contract of Alexander Colin (see Colin, A.) he is mentioned with five others.

Koch, *Das Heidelberger Schloss.*

ANTICUM. Same as Pronaos.

ANTIMACHIDES; architect.

Associated with Antistates and others in the commencement of the temple of Zeus at Athens under Peisistratos.

Brunn, *Geschichte der griechischen Künstler.*

ANTIPARABEMA. One of two chapels at the west end of a Byzantine church, especially of the Armenian type; it corresponds to similar chapels (see Parabema) at the east end.

ANTIPHILOS; architect.

Antiphilos is mentioned by Pausanias as one of the architects of the Treasury of the Carthaginians at Olympia, the others being Pothæus and Megacles. This was probably the fourth from the west in the series of treasuries discovered on the northern side of the Altis at Olympia (Greece). It was built by the Syracusans and was popularly called Carthaginian on account of the spoils from the Carthaginians which it contained.

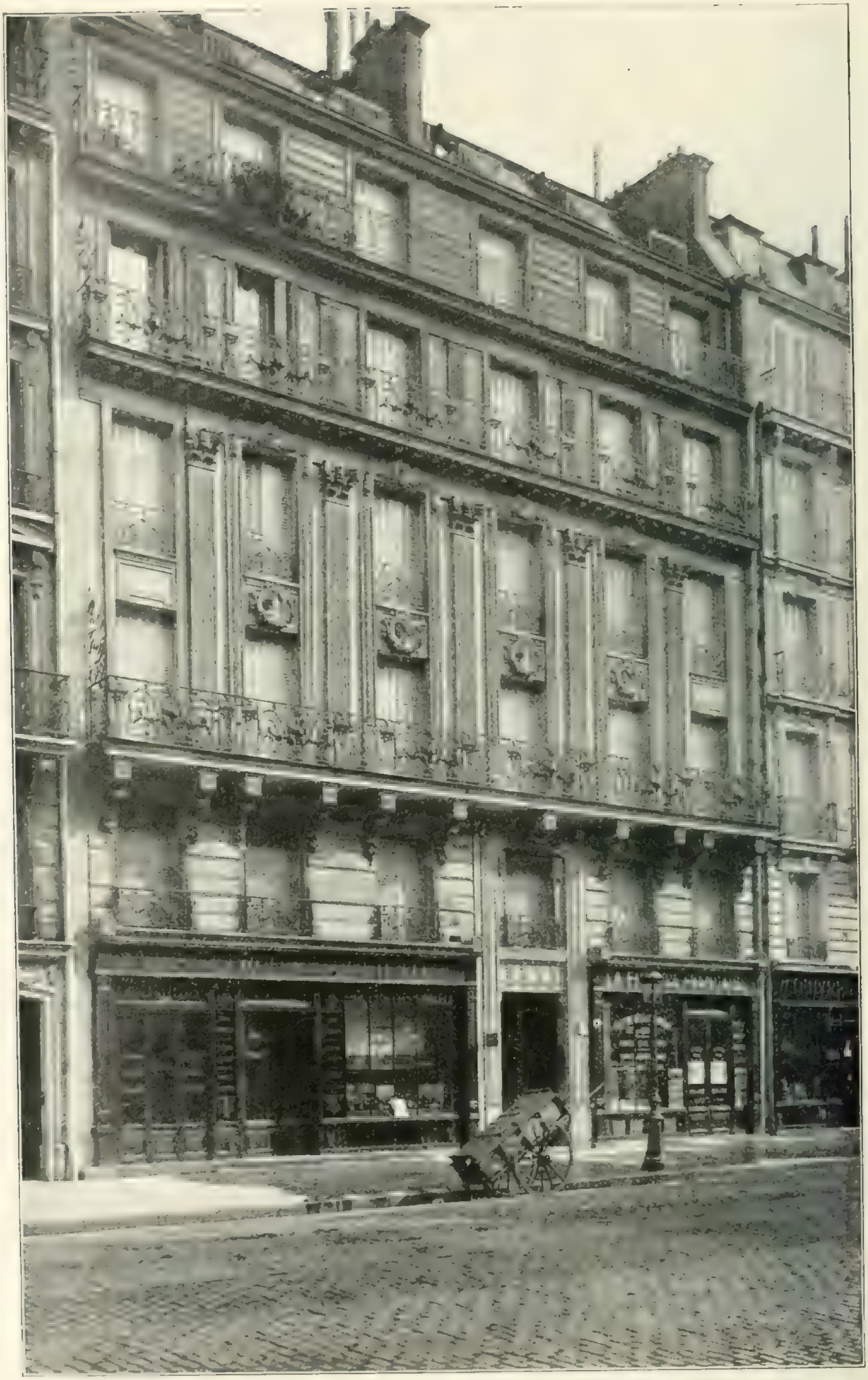
Pausanias, *Description of Greece*, ed. J. A. Frazer; Curtius and Adler, *Olympia.*

ANTIS, IN. Between *antæ* (see Anta), said of columns in a portico, and by extension, of the portico itself. Thus, a portico of two columns between antæ is said to be *distyle in antis.*

In a few modern buildings, as in the Bowery Savings Bank, New York City, the intercolumniation in the middle is very wide, the two columns being set close to the antæ so as to allow of a broad and unencumbered entrance. (Cut, col. 81.)

ANTISTATES; architect.

According to Vitruvius (VII., præf. 75) the architects Antistates, Kallæschros, Antimachides, and Porinos laid the foundation of the temple of Olympian Zeus at Athens during the reign of Peisistratos. According to Aristotle (*Polit.*



APARTMENT HOUSE

A modern one in Paris, in the quarter near the S. Lazare Station. The façade is at once more florid than is customary in Paris, with more elaborate carving and wrought iron work, and also more stately, probably by reason of the order of pilasters, which faces two stories of the building. The management of that architectural *étage* is worthy of notice. The solecism of supporting the whole elaborate façade on shop windows is inevitable in modern street architecture.

V., 11; the work was interrupted by the banishment of Hippias the son of Peisistratos in 510 B.C. (For the continuation of this building see Cossutius.)

Vitruvius, ed. Marini; Brunn, *Geschichte der griechischen Künstler.*

ANTOINE, JACQUES DENIS; architect; b. Aug. 6, 1733, at Paris; d. Aug. 24, 1801.

Antoine began his career as a working mason. In 1768 he was commissioned to build the Hôtel des Monnaies in Paris (finished 1775). The plans and elevations of this building were published in a monograph after his death. He was attached to the works at the Palais de Justice (Paris) after the conflagration of 1776, and constructed the great stairway and grille of the Cour d'Honneur. (See Couture, G. M.) Antoine decorated the audience halls of the Cour Royale and built other important parts of the Palais de Justice. He introduced the use of the Greek Doric order in Paris in the little façade which he built for the Hôpital de la Charité.

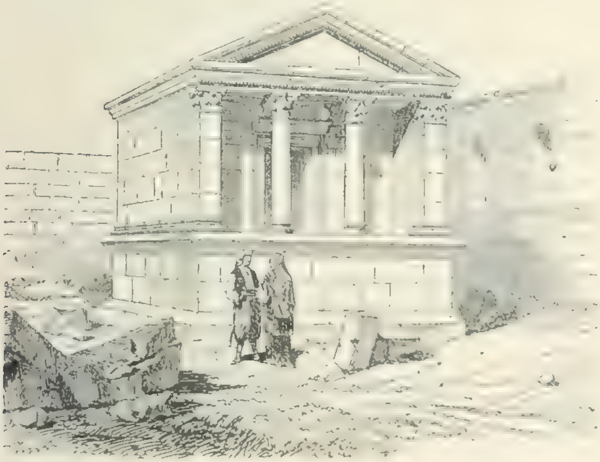
Lussault, *Éloge d'Antoine*; Quatremère de Quincy, *Histoire des plus célèbres architectes*; J. D. Antoine, *Hôtel des Monnaies à Paris.*

ANTONIO DI BANCO. (See Nanni d' Antonio di Banco.)

ANTONIO DI PIETRO PAOLO (Dalle Masegne?); architect.

This Antonio is supposed to have been a son of Pietro Paolo dalle Masegne (see Masegne, P. P.), the Venetian architect. He built the Church of S. Giacomo at Sebenico (Dalmatia), and in 1430 began the cathedral of that city. In 1441 he was superseded by Giorgio Orsini (see Orsini, G.).

Jackson, *Dalmatia*; Galvani, *Il re d'Armi*, etc.



In Antis: Syrian Portico, 4th or 5th Century A.D.

ANTONIO DI VICENZO: architect and military engineer.

In a document of July 3, 1386, he is mentioned as constructor of the bastion of S. Procolo (Bologna) which was still in existence in the sixteenth century. (See Giovanni da Siena.) He made the design and model for the great basilica of S. Petronio at Bologna apparently with the assistance of Fra Andrea Manfredi (see Manfredi), and on June 9 laid the first stone of this building.

Angelo Gatti, *Maestro Antonio di Vicenzo*; Guidini, *Cose Mirabili*, etc.

APARTMENT. *A.* A room, or a room with antechamber, or with alcove and closets; especially, in English usage, such a room with appurtenances when occupied as a bedchamber.

B. A number of rooms with the necessary corridors, passages, and the like, occupied as a dwelling by one inhabitant or one family. This usage is connected with the French term *appartement.*

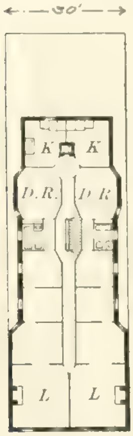
The sense *A* is uncommon except in writing of some pretension; the sense *B* is comparatively rare in England, but has become very common in the cities of the United States since the introduction of the Apartment House (which see) about 1865. It is generally held that an apartment, technically so called, contains a complete establishment with private hall and complete inner communication between the different rooms composing it. There are, however, apartments which have no kitchen, the occupants being expected to use the restaurant of the house. (See Apartment Hotel.) — R. S.

APARTMENT HOTEL. A building divided into suites for families, but without private kitchens and the like, the guests being supposed to use the restaurant of the house. This term is coming into use to mark the distinction between this class of building and the ordinary Apartment House (which see), in which each apartment is a complete dwelling.

APARTMENT HOUSE. A building intended to be occupied in separate apartments; especially in American cities since 1870, a home for independent housekeeping by generally more than two families, the rental for an apartment exceeding $300 per annum. Low-priced apartments are frequently called flats. (For the popular distinction made between Apartment, Flat, and Tenement, see Tenement.)

Historical. The high grade apartment for the richer classes is undoubtedly of very much later origin than the tenement. In New York, by law all buildings, whether they are called apartment house, tenement house, or flats, are classed as tenement houses. The apartment house, as it is now understood in the United States, is architecturally an independent and distinct type. There was probably an im-

[illegible] designed tenement [illegible] apartment, and then a further development, which finally tempted wealthier people into living in this way. Many causes combined to create a demand for high-class apartments in spite of the prejudice of the gentry and lesser nobility against them. It was natural that the demand should first have been felt upon the Continent of Europe, and from the early years of the eighteenth century on, the élite of Paris have not hesitated to occupy apartments, and the private dwelling has become more rare with each decade. Other cities followed this example, until now apartment houses are common everywhere upon the Continent of Europe. In Great Britain they have never been popular, and in America have only become so within the last twenty years. A five-story non-fireproof apartment house, erected on a street to the east of Union Square, New York City, was the first building of this kind in the United States.

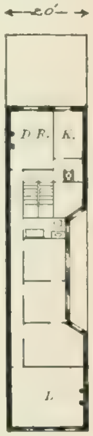


Apartment House: Fig. 1. Two Apartments to a Floor.

A house with apartments of this character is more often called Tenement House (which see). In this and the other figures, L Living Room, often called Parlour; K Kitchen; P Pantry; D R Dining Room.

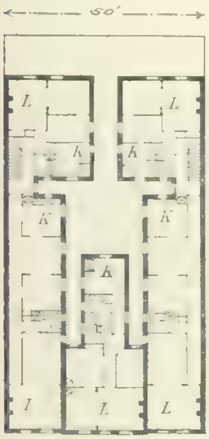
It was of course necessary to make the apartment house attractive from the start to secure a high class of tenants, and so the commercial influences operated to make the apartment house a new type as good sanitarily as the dwelling of the same class. With the apartment house once established, the development in this direction has been down the scale of prices, applying the idea to constantly less expensive accommodations.

Plan. Each apartment must consist of a parlour, a dining room, a kitchen, a bathroom, a servant's bedroom, and one or more bedrooms of larger size. The kitchen should connect with the dining room and private hall through the butler's pantry, where such exists. Each room must open to the outer air, and be connected to a private hall, which, in turn, connects to the public hall, which latter must contain the main stairway and the elevator when installed. There must be a dumb-waiter or a passenger elevator exclusively for service, readily accessible to all of the kitchens. The stairways should be without winders, 2 feet 6 inches wide for five stories or less, increasing to 3 feet 2 inches for ten stories. The main stair landings should be from 3 feet 6 inches to 5 feet in width; the private halls from 3 feet 10 inches upwards in width, and the entrance hall, which gives access to the dining room and parlour, and is an extension of the private hall, should be 4 feet 6 inches in width. The dumb-waiters should be 2 feet 6 inches by 2 feet in the clear; the passenger elevator, where there is one, should be at least 25 square feet in area; the service elevator, where there is one, should be at least 16 square feet in area. Storage space must be provided for the tenants in the cellar, and drying space for the wash either in the cellar or on the roof. The main entrance hall should be at least 7 feet wide with a separate entrance provided for the tradesmen. The parlour should be at least 180, the dining room 150, the kitchen 120, the bathroom 45, and the servant's bedroom 75 square feet in area as a minimum. The demands for light and air require the development of a practically square plan with one or more buildings on a lot, all of the rooms of the apartment opening from or near the central hall, two or more such apartments being grouped on a lot of size adequate for the purpose, the proportion of the lot occupied by the building depending on its shape. The usual American practice, since nearly all city lots in America are rectangles, is nearly as follows. The unit lot in New York City, being four times as deep as it is broad, requires that the main stair hall give access to the parlour, dining room, and perhaps the kitchen, with a long and narrow hall connecting the other rooms, making the plan for one apartment nearly rectangular, with an enlargement at the end containing the principal rooms. Many ingenious plans have been devised with small shafts and courts, and a wonderful irregularity of outline; but with a better understanding of the problem, the plan has become simplified to the outline given. Provision for light and air, while following in its general principles those laid down under Office Building, is subject to this modification, that direct sunlight without any limit is desirable for those rooms most used by the family in the daytime; in consequence those buildings with the long axis east and west fronting on the street are usually the most remunerative. Where courts must be employed they should be made as large as possible, and should always be open at one end toward the point from which the prevailing summer breezes blow. Each should be arranged with the long axis in a northerly and southerly direction. All the living or principal rooms should have a southern exposure as far as practicable. Fig. 1 illustrates a conventional building on a narrow lot, intended for two families per floor, the light and ventilation being both a



Apartment House. Fig. 2.

minimum and inadequate in a closely built up neighborhood. Fig. 2 represents a common arrangement on a narrow lot for one family per floor. In both cases the height of the building is limited to five stories. Fig. 3 illustrates the lowest grade of apartment or high grade flat house on a larger lot and with better provision made for light and ventilation. Fig. 4 illustrates a higher grade apartment in an exceptionally good location. Finally, Fig. 5 illustrates the latest type of apartment house.



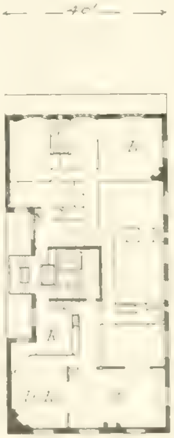
Apartment House: Fig. 3.

The modification of the general principle of plan required by the varying sizes of the units is well illustrated in the various plans. Municipal regulations very frequently fix the height of stories, area of lot which may be occupied, sizes of stairways, and other details which of course must be taken cognizance of in the planning. The great objection to the plan as developed is the necessity of either screening the bedroom windows by the use of wrinkled glass, ground glass, or shades, or else surrendering a very necessary privacy due to the inevitable proximity of windows practically facing one another across relatively narrow courts. These objections can only be met by considering the bedroom simply as a sleeping room, and frankly screening it from outside observation, shutting off also all outside view, in which case the windows could be made broader and less high, and the rooms themselves smaller, utilizing the space thus saved by the addition of a sitting room at some sunny point. The development of the ideal apartment, avoiding all objectionable features, is practicable only on a very large site where the commercial returns anticipated are moderate. This has been attempted but without any very striking success thus far. The development of the modification of the apartment house as an apartment hotel, which is practically an hotel divided into suites for family use, is subject to the same general limitation as to light and air. It is unnecessary, however, to provide kitchens, servants' rooms, and the other conveniences which go with them, and in consequence there is a greater liberty in planning, and the problem is more like that of an office building.

Construction. All apartment houses should be constructed fireproof and with unbroken fireproof walls between the apartments as far as practicable, securing in this way the maximum protection against fire and disease. Modifications may be made as permitted by building regulations and demanded by commercial considerations, but in all cases the first floor, stairways, elevator, and dumb-waiter shafts must be made absolutely fireproof in themselves, and be shut off from the balance of the building by means of fireproof doors. The stairway to the cellar from the first floor should in all cases be away from the other stairway, and, if inside of the building, be fireproof. Commercial considerations will determine whether or not the walls should sustain the floors, sustain only themselves, or be sustained by a skeleton construction.

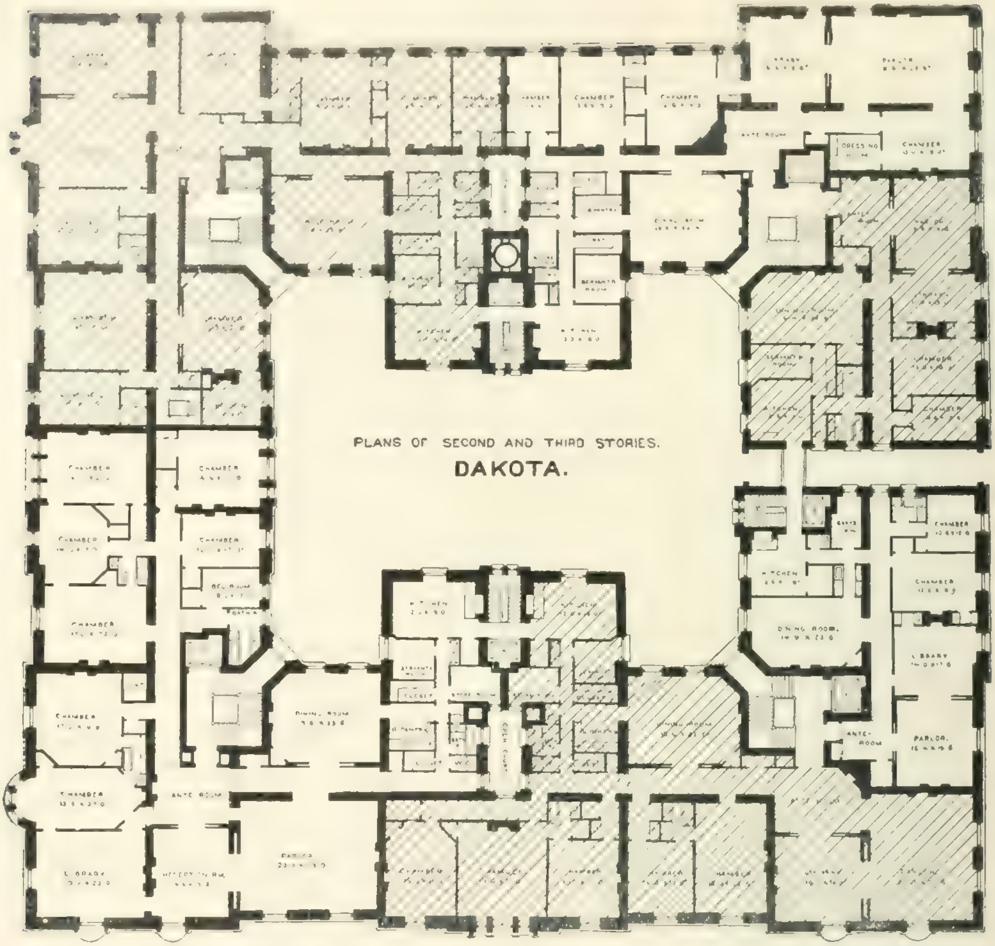
Fire Escapes. Where the building is not completely of fireproof construction, fire escapes should be provided for each vertical range of apartments, the ladders or steps being at least 2 feet wide, and the platforms having an area of at least 15 square feet.

Toilets. In connection with the kitchen and servants' quarters there should be a toilet room with one water-closet and a basin or one small bathtub. As the number of rooms and rental of the apartments increase, a more generous provision may be made for the servants and even provision made for both sexes. In the kitchen there should be two laundry tubs, one of 22 inches and one of 28 inches in length; one sink; either a gas or coal range, gas being now preferred; either mechanically cooled boxes for refrigerating purposes or a refrigerating waste line with drip pans and connections, the waste line discharging over a sink in the cellar, and space provided for the setting of portable refrigerators over the waste. In the butler's pantry a sink, and in the family bathroom a bathtub, water-closet and washbasin. All bathrooms or toilet rooms should have the floors and side walls to a height of at least 2 feet made impervious to moisture; the present practice is to use marble or mosaic floors, marble or tile wainscoting at least 4 feet high, with large basin slabs, and the fixtures and plumbing of the most approved sanitary type. The glazing of all toilet room windows should be in wrinkled, ground, or other white obscured glass.



Apartment House: Fig. 4.

Lighting. Provision should be made for lighting both by gas and electricity, using centre outlet combination fixtures in the principal rooms; in the kitchen and pantries the outlets should be over the sinks, in the bedrooms ceiling outlets near the bureau location. The mains supplying the lights should [illegible]



Apartment House "The Dakota," New York Fig. 5 (Architect, H. J. Hardenbergh.)

Plan of an upper story, showing six separate dwellings

location with provision made for placing meters independently on the branch main to each apartment. The lighting of the public halls and elevators is at the owners' expense from separate mains. Sometimes two mains are installed, one for the evening service and the other for the all night service, the mains being controlled by separate switches.

Heating. Depending on the class of apartments either all the building or only the public parts are heated by the owner. Where the entire building is heated, low pressure steam or hot water with direct radiation is used. Where only the halls are heated, either a hot air furnace with large registers in the first story, or hot water radiators, supplied from the hot water heating system, may be installed. Hot water should be supplied to all of the sinks, laundry tubs, and washtubs by the owner of the building, the heating being done by a central heater.

Conveniences. In the lower grade apartment houses letter boxes with push buttons connected to the kitchen of each apartment are installed in the vestibule, and an electric door opener is placed on the vestibule door, controlled from each apartment. In the higher grade apartments, where a hall boy is employed to open the front door, and sometimes in less elaborate houses, a speaking tube telephone system is installed in the first floor hall connected with each apartment, having a switch and extension telephone into the janitor's rooms for use after hours. During the hours of service of the hall boy, visitors can ascertain whether or not the people they wish to see are at home without going upstairs, and the tenants can communicate with the janitor at any time. In all cases speaking tubes connected with each kitchen are placed beside the dumb-waiter for the use of the tradesmen.

Fire places are usually installed in one or more rooms for either gas logs, or coal.

Plant. In the higher grade apartments having two or more passenger elevators, it is customary and economical to install an independent plant for the operation of the building, using the exhaust steam for heating, furnishing mechanical refrigeration to all apartments, and electric current for light to all tenants. Under these circumstances the janitor is the chief engineer and should be a good mechanic as well, attending to all minor repairs throughout the building. — GEORGE HILL.

APODYTERIUM. An undressing room in a Roman bath. It was near the entrance, but its exact character and disposition are not clear. The younger Pliny is the only Roman writer who uses the term. (See Thermae.)

APOLLODOROS OF DAMASCUS; architect.

According to Procopius (op. cit. IV., 6) Apollodorus superintended the works undertaken by Trajan (emperor 97–117 A. D.). These were the Forum of Trajan at Rome, with the basilica and the famous sculptured column, and a gymnasium and odeon at Rome. He built also the bridge which Trajan threw over the Danube. Apollodorus was also employed by Trajan's successor, Hadrian (emperor 117–138), at whose request he composed his *Poliorceticus*, a work on engines of war. The accepted story of Dion Cassius, that Hadrian was jealous of Apollodorus and murdered him on account of certain criticisms which he made of the emperor's designs for a temple of Venus and Roma at Rome, is discredited by Duruy.

Brunn, *Geschichte der griechischen Künstler*; Duruy, *Histoire des Romains*; Procopius, *De Ædificiis Justiniani*.

APOPHYGE. The outward spread of the bottom of a shaft to form the fillet or cincture by which it joins the base; also applied sometimes to the similar but slighter expansion at the top under the astragal. (Compare Congée.) The term is usually restricted to classic columns. (See Base; Column; Greco-Roman; Shaft.)

APOTHESIS. According to Vitruvius (IV., 1), an increase of thickness of the Corinthian shaft at the top; apparently a copyist's error for Vitruvius's term Apophyge (which see).

APPELMANS, PIETER; architect; d. May 25, 1434.

Appelmans flourished at Antwerp (Belgium) in the early fifteenth century. He designed the Church of S. George in that city and began the cathedral. In 1420 he designed the famous tower of the cathedral which was finished in 1518.

Immerzeel, *Hollandsche en Vlaamsche Kunstschilders, Beeldhouwers*, etc.

APPENTICE. A subordinate or minor structure built against an edifice, and having a roof with a single slope, same as penthouse, but confused with the common terms "appendix" and "appendage."

APPLIQUE. An accessory decorative feature applied to an object or structure; the French term gradually becoming common in English. It may be as small as a bronze handle on the front of a drawer or shutter, or as large as a marble tabernacle set up against the wall of a room. In decorative art the term is applied to a piece of one substance set upon a surface of other material, for decorative effect.

APPLIQUÉ (adj.). Applied to a surface; especially for decorative effect. The term is French, and is used in English more especially in embroidery, but it is common among dealers in decorative objects and their customers. Sometimes used absolutely, as a noun; but in this use the word Applique is better.

APPRAISAL. A legally binding written statement of the value of any land or building, or of labor or material entering into a building; a formal and official valuation. In Great Britain appraisals can be made only by licensed appraisers. (For the custom in France, see Architect, The, in France.) In the United States generally, appraisals may be made by experts selected conjointly by the parties to the matter in dispute, or by a commission appointed by the court, referee, or arbitrator having jurisdiction over the question at issue. In cases of claims for "extras" on building contracts, of unfulfilled or surrendered contracts, and of loss or damage of any kind, a correct appraisal is of great importance.

APPRAISE. To estimate the value of in a formal way. (See Appraisal.)

APPROACH. The avenue leading up to a building, especially (in English usage) from the park gates to the front of a manor house or country-seat.

APPUI. In French, the sill, as of a window; the appui forming the top part of the Allège (which see) and constituting usually a solid and separate member. The term signifies in French also a hand rail or top rail of a balustrade, or the like.

APRON. In general, a more or less flat member placed over or against a construction to protect the parts below, as a drip or hood; hence, any similar member whether so used or not. Specifically: —

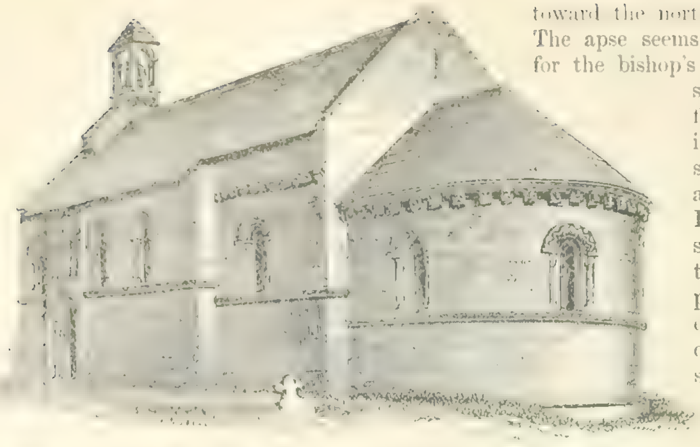
A. The horizontal portion of a window trim placed under the nosing of the inside sill or stool; consisting generally of a somewhat wide flat surface with a moulding beneath.

B. A strip of lead, tin, or other roofing material, set into a wall and bent down over the flashing; or extending over a gutter to direct the water; or similarly used.

C. The ornamental work below the cornice of a verandah. — A. P. S.

APRON LINING. The casing, or applied facing, of an Apron Piece.

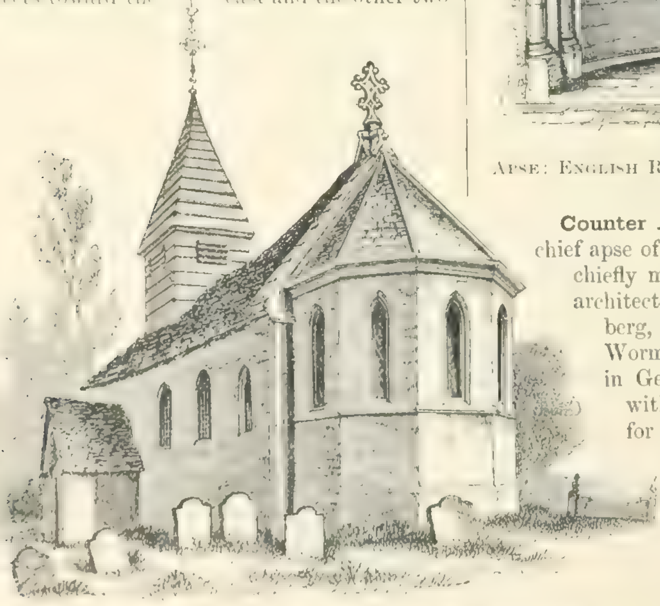
APRON MOULDING. A small moulding in place of an apron as defined under Apron, A.



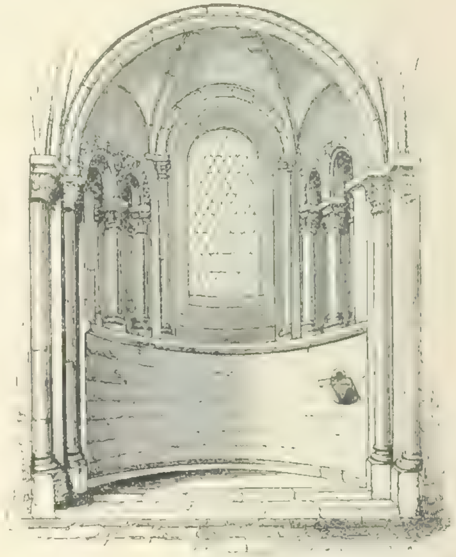
Apse, Scottish Romanesque; Dalmeny, Linlithgowshire, c. 1150.

APRON PIECE. In stair building a horizontal timber into which the carriage pieces and joistings at a half space are framed.

APSE. A nearly semicircular part of a building, forming a projection from the exterior wall, and the interior forming a large and deep niche. In Roman basilicas such a round projection seems to have been used as a court room (see Basilica). In Christian churches of the earlier years in the Byzantine, Latin, and Romanesque styles, the apse was used either singly or in threes. In some cases, an apse at either end of the church is found, as in the Cathedral of Bamberg, this arrangement is thought to have arisen from a change in the liturgical rite (see Orientation). Where there are three apses, they are sometimes side by side at the eastern or choir end of the church; and sometimes one projects toward the east and the other two toward the north and south (see Triapsidal). The apse seems originally to have been used for the bishop's throne and the seats of his subordinate clergy, probably following a tradition of Roman imperial times concerning the seating of the magistrates. The apse is rarely polygonal in the Roman styles. In the Gothic styles and in later styles, the term apse is used for the simpler projections at or near the east end; thus, in a small parish church the five-sided or seven-sided projection with an aisle is often called an apse, but the term would not be applied often to the chevet of a great cathedral with a deambulatory and chapels. (Cuts, cols. 93, 94; 95, 96.) R. S.

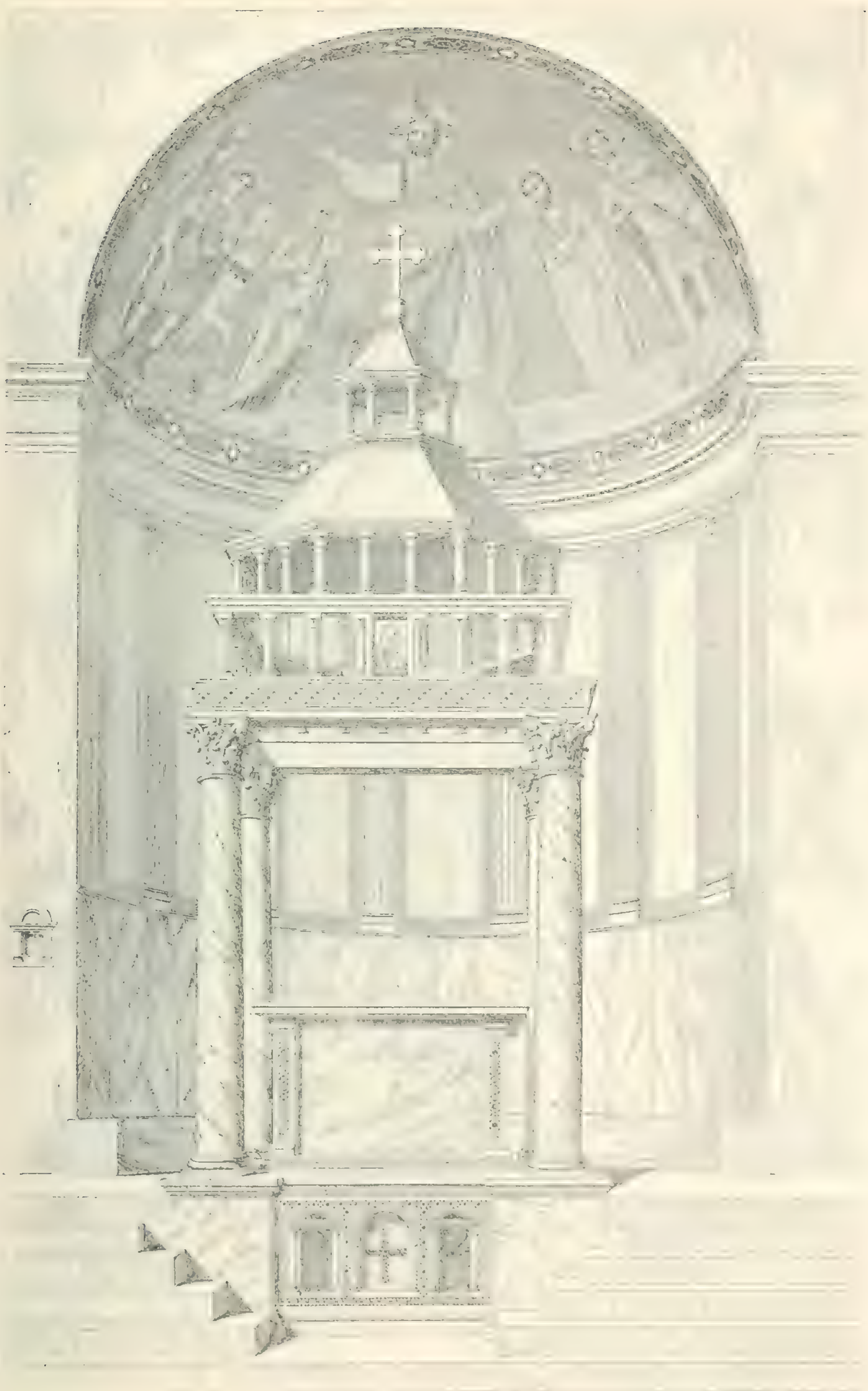


Apse, English, 13th Century; Tidmarsh, Berkshire.



Apse: English Romanesque; Romsey, Hants, c. 1180.

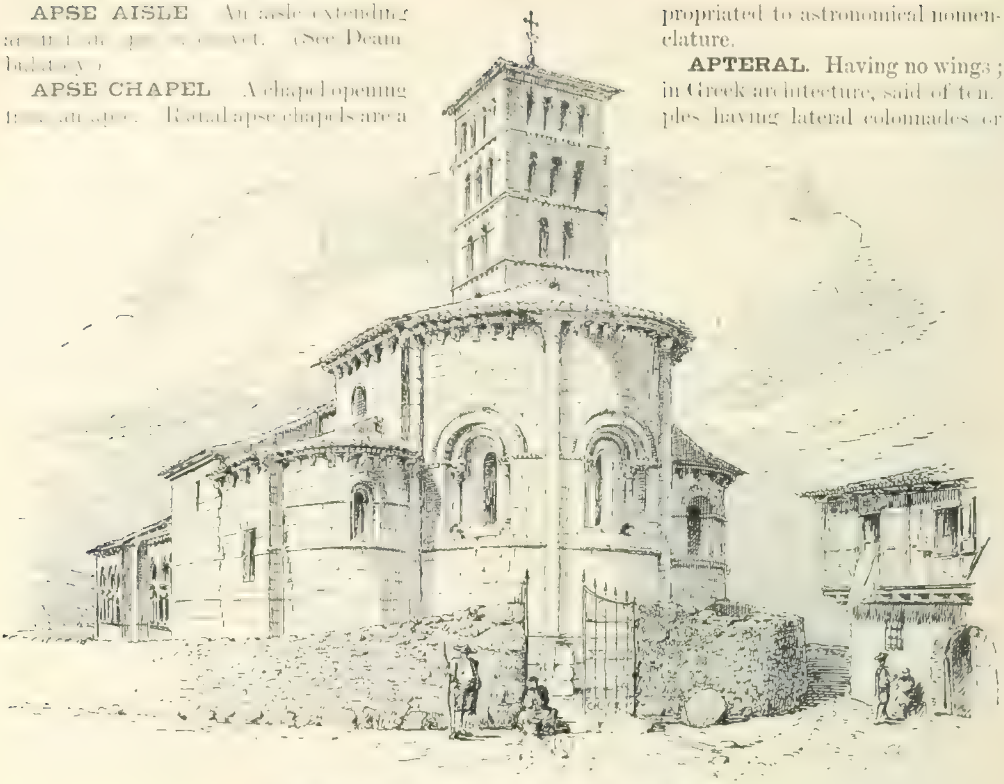
Counter Apse. An apse opposite the chief apse of a church. Counter apses are chiefly met with in German mediæval architecture, as in the cathedrals of Bamberg, Mayence, Spires, Treves, and Worms, and seem to have originated in German monastic arrangements, with the object of providing either for the joint worship of monks and nuns, or for some liturgical purpose such as a change in the position of the officiating priest (see Orientation). There are very few instances of its use outside of Germany.



APSE — S. GIORGIO AL VELABRO, ROME.

APSE AISLE. An aisle extending around the apse or chevet. (See Deambulatory.)

APSE CHAPEL. A chapel opening from an apse. Radial apse chapels are a conspicuous feature of French Gothic architecture, as in Amiens, Bourges, Chartres, and Paris cathedrals, whence they were adopted into the German Gothic, as at Cologne. They are found even in the French Romanesque, *e.g.* Notre-Dame-du-Port at Clermont, S. Paul at Issoire. The English examples are few, Westminster Abbey the most perfect.



Apse: Spanish Romanesque, 12th Century.

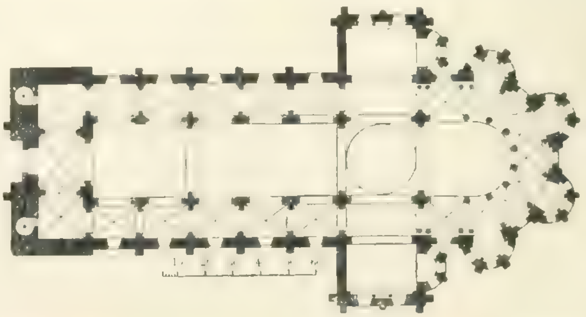
APSID. Same as Apse.

APSIDAL. *A.* Having the form of an apse or of rounded projection, as an apsidal termination of an east end.

B. Pertaining to an apse; attached to an apse, as, apsidal chapel, the same as apse chapel.

APSIDIOLE. A small apse; especially an apse projecting from a larger one, as where chapels project from the larger apse of the choir.

APSIS (pl. Apsides). Same as Apse. This form of the word follows the Latin original, but it has been mainly appropriated to astronomical nomenclature.



Apse Chapel, Church of Notre Dame-du-Port, Clermont-Ferrand

With four apse chapels and two chapels or apsidioles [illegible] transept

APTERAL. Having no wings; in Greek architecture, said of temples having lateral colonnades or *pteromata;* in mediæval architecture, said of churches without aisles, and more especially of the fronts of such churches, as those have only a single gabled roof above straight and simple side walls.

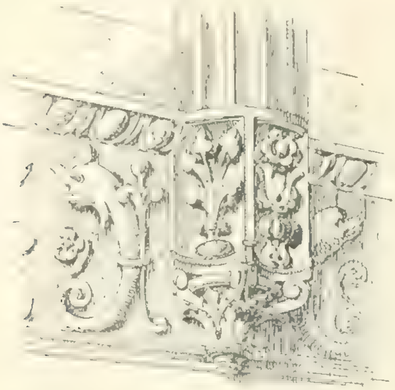
APTEROS. Without wings; said of a personage to whom wings are generally ascribed, as, Nike Apteros, the wingless Victory of the Greeks, perhaps to be indentified with the goddess Athene, when appearing as a personification of Victory.

AQUARIUM. *A.* A vessel such as a box or tank with at least one side of glass which, when filled with water, may be used for the keeping of live fish, crustacea, and other creatures who live habitually in the water. It is customary to furnish such vessels with water plants and some surface of rock or pebbles to which such plants can attach themselves. The preparation of such aquaria is a matter of considerable scientific and practical skill.

B. An establishment for the safe keeping, care, and display of a number of such tanks as in sense *A*. Such establishments have been set up for private profit and others at the public cost. One of the most extensive and elaborate is the one at Naples which is celebrated all over Europe. One of considerable importance has been established in New York in the building called Castle Garden, on the Battery. — R. S.

AQUEDUCT. A structure adapted for the transportation of water in large quantities to a considerable distance, consisting of a pipe or channel of any form, but usually covered and protected from injury. It has been usually held essential that the water should follow a tolerably even slope or descent from the supply to the fountain or reservoir where it is delivered. If an attempt is made to carry the water down one side of a valley and up the other, trusting to the natural rise of the water to its own level in an air-tight pipe, the difficulty of keeping the pipe air-tight is found to be almost insuperable, and the pressure of the water upon the joints, etc., so great as to make this kind of structure uneconomical. For this reason, the ancients followed the plan of carrying the water through tunnels sunk deep in the ground where it passed through hilly country, and carried it on long rows of lofty arches where it crossed a wide and deep valley; and modern practice is nearly the same so far as the recognized necessity of keeping a nearly uniform level. Modern appliances have, however, made it practicable to use what is called an inverted siphon; thus, in the two Croton aqueducts which supply New York City, the older one dropped its course a little where it is carried on High Bridge across the Harlem River; and that of 1885 and subsequent years crosses the Harlem River by such a siphon several hundred feet lower than its general course and sunk deep below the bed of the river. Modern engineering has also at its command boring and excavating processes not known until the second half of the nineteenth century. Thus, in the case of the two aqueducts named above, the first, built before 1841, follows a comparatively winding path, keeps as near as possible to the surface of the ground, and, as stated above, crosses a lofty aqueduct bridge; while the more recent one follows a direct course far beneath the surface. This distinction depends mainly upon the boring machines in use and the use of high explosives for blasting. For this reason, the modern aqueduct passes entirely outside of the domain of architecture.

The aqueducts of antiquity were extremely numerous. Those which have excited the most attention, and rightly, are at Rome, which city was supplied with water brought from a distance as early as 312 B.C. Others were built in rapid succession, and it frequently happened that one was placed upon another so that the same tunnel enlarged or the same row of arches crossing a valley would carry the two or three water courses. Thus, in a well-known case, the Aqua Julia, built B.C. 33, the Aqua Tepula, and the Aqua Marcia are all carried through the walls of Rome at the same point. The water course itself was sometimes a boxlike tube of quadrilateral section, and built of stone; sometimes of brick laid in mortar and arched. It is probable, however, that whatever the material of the channel it was lined with hydraulic cement, or by a fine concrete made of such cement and sand or finely broken stone or brick. Where these channels are supported upon arcades considerable interest seems to have been taken in the decorative effect of the whole structure. Those arcades which cross the Campagna at Rome are so very long that it was natural to seek the most simple means of doing the necessary work; but shorter aqueduct bridges, such as that which crosses the river Gard and supplies the city of Nîmes in southern France (see Pont du Gard) and that which supplies the city of Tarragona and which has a height of nearly one hundred feet with eleven great arches below carrying a second row of twenty-five arches, are but types of the really noble compositions which the Roman engineers produced. Modern engineering is too completely a matter of economy in the expenditure of force and of money to allow of thought on the part of the engineer for the resulting effect; but Roman work was done for a community which had not yet learned to erect anything without some pretensions to beauty of effect. These aqueducts of antiquity generally terminated in a showy reservoir, fountain, or *castellum*, and apparently these were of very considerable importance and beauty. None of them remain in good condition, but some have been found not so completely destroyed among Roman remains in North Africa. Mediæval aqueducts, necessarily inferior in extent to those of the Roman Empire in its great time, had still architectural character. The short one built by Pope Damasus in the twelfth century to carry the water from the fountain of the great basilica of S. Peter's to the Vatican Palace has its fountain of exit in the court named from that Pope (*Cortile di S. Damaso*), upon which open the private apartments of the Pope and the famous loggie of Raphael. This fountain was rebuilt in the seventeenth century. At Montpellier (Hérault) in southern France is a very interesting aqueduct built in the reign of Louis XV. Where this approaches the city it is carried on a very well-designed bridge with two rows of arches, fifty-three in the lower row and one hundred and eighty-three above. This bridge terminates in a [illegible] of the same [illegible]



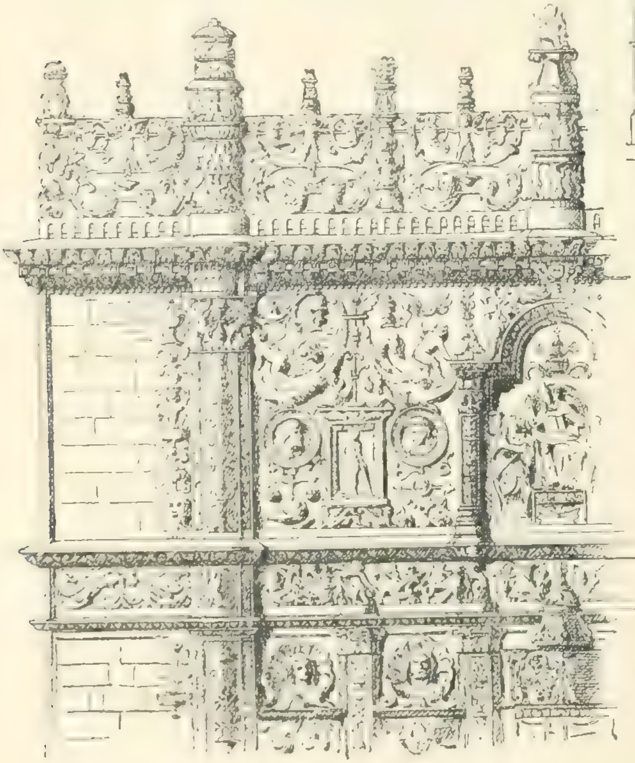
Arabesque: Spanish, 16th Century.

and of considerable size. In the city of Rome modern fountains occupy the sites of many of the ancient castella; the most famous of these being the fountain of Trevi. — R. S.

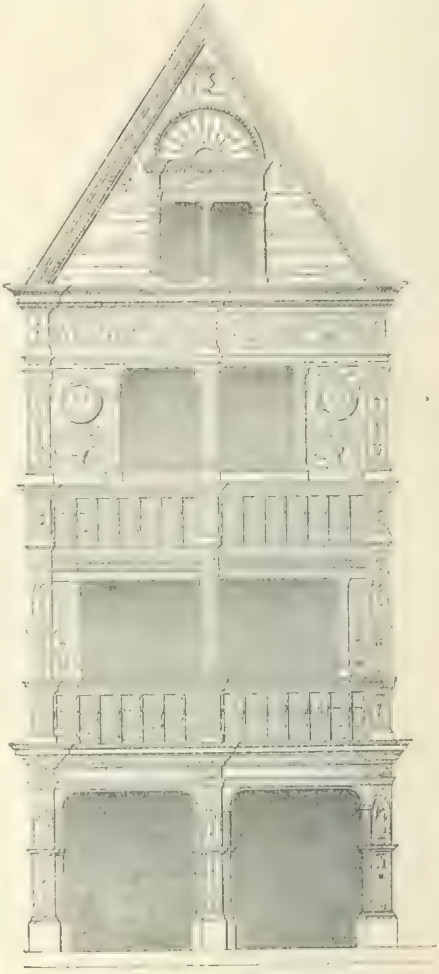
See works mentioned as authorities for Roman Imperial Architecture, especially Middleton's *Remains of Ancient Rome*, and those by Lanciani.

AQUITAINE, ARCHITECTURE OF. (See France, Architecture of.)

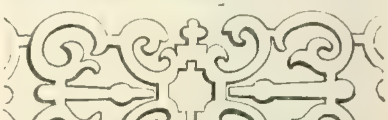
ARABESQUE. A piece of decorative scroll work or other ornament not closely studied from nature. Although the term is taken from Arabian, that is Eastern, ornament, it is applied generally to work of European design. The paintings in Roman houses discovered in Pompeii or on the Palatine, at Rome, the sculptured reliefs of the same epoch when they cover broad panels instead of narrow bands, and the imitations of such Roman work in the fifteenth and sixteenth centuries are commonly called arabesques. (See Roman Imperial Architecture; Renaissance Architecture; Classic; Neoclassic; also, Ornament; Relief; Sculpture.) (Cut, cols. 101, 102.)



Arabesque: Spanish, 16th Century.

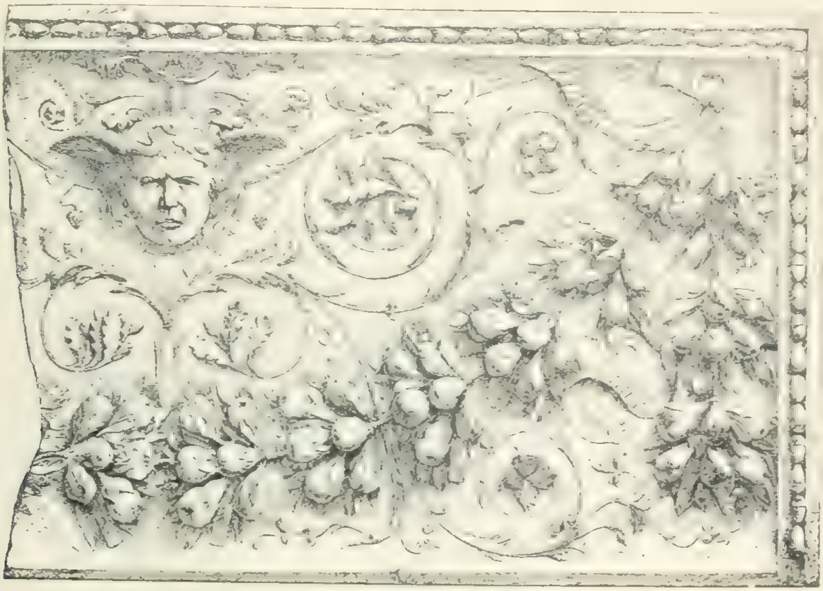


Arabesques in Carved Wood.
Adorning a 15th century house at Rouen.



Arabesque, Elizabethan.

ARABIAN ARCHITECTURE. The architecture of the Arabs. In their native country there is little architecture of importance. When, as conquerors under the first caliphs, they had occupied a large part of Syria, Egypt, Persia, and other Oriental countries, an architecture took shape which is called by the French *Architecture Arabe*, but this contains very little indigenous or native character, and is almost wholly the work of Byzantine or Persian artists working for their new masters. The most important buildings of the style are in Cairo, and others exist in Damascus. The architecture of the conquerors of North Africa and of Spain is generally, and more properly, called Moorish. The term "Arab," or "Arabian," as applied to architecture, has in it something erroneous, and therefore it is not used as the heading of any historical article in this Dictionary. (See, besides Moslem Architecture, the following: Balkan Peninsula; India; Persia; also Cairene; Hispano-Moresque; Moorish; Saracenic; Siculo-Arabian; also Minaret; Minar; Mosque.) — R. S.



Arabesque. Early 16th Century, Italian Terra Cotta.

ARABO-BYZANTINE. Saracenic, or early Mohammedan, in style. (See Moslem Architecture.)

ARÆOSTYLE. Having columns separated by a clear space of four or more diameters; used exclusively of the intercolumniations of classic columnar edifices. (See Columnar Architecture; Intercolumniation.)

ARÆOSYSTYLE. Alternately aræostyle and systyle; *i.e.*, having columns alternately spaced two diameters and four or more diameters apart in the clear. Written also Areosystyle.

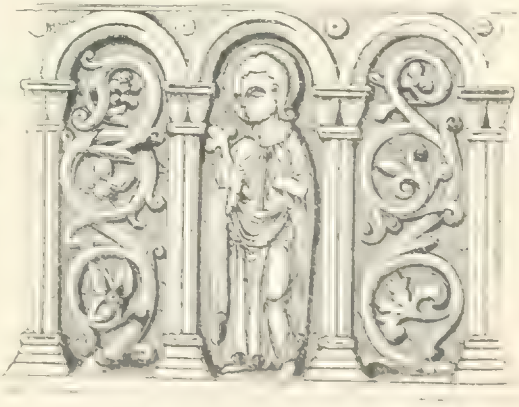
(See Accouplement; Columnar Architecture; Coupled Column, under Column.)

ARBOR; **ARBOUR**. A light openwork structure of wood or metal, covered or intended to be covered with vines, as in a park or garden. When formed by two or more rows of posts or columns so as to provide a covered walk, it is sometimes called a Pergola.

ARC. Any curved construction in plastering, wood, or ironwork, as distinguished from arch. (A. P. S.) Not so used in the United States.

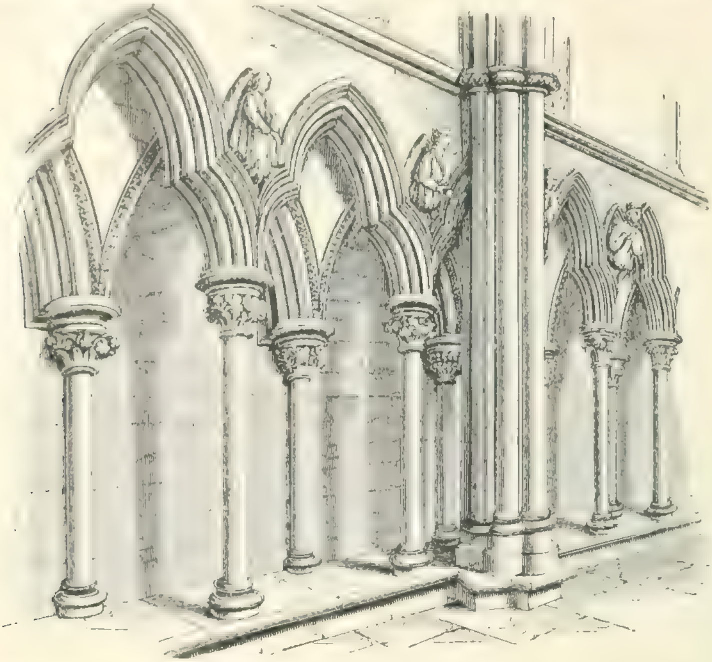
ARCA, NICCOLÒ DELL'. (See Niccolò Dell' Arca.)

ARCADE (I). *A*. Two or more arches with their imposts, piers, columns, or the like taken together and considered as a single architectural feature. It is [illegible]

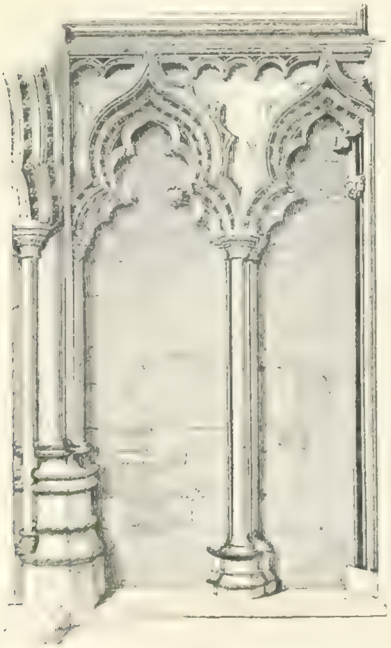


Arcade [illegible]

for a considerable number of arches, and especially where they are small and where the whole feature is as much decorative as useful. Thus, one of the four sides of a vaulted cloister would be more commonly spoken of as an ambulatory, or a gallery, although the word arcade might be used for the row of arches as they are seen from the garth within.

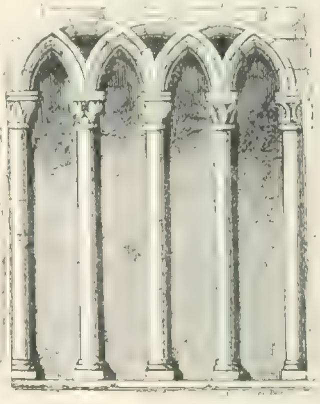


Arcade: South Aisle of Choir, Lincoln Cathedral; 14th Century.



Arcade: 14th Century; Lincoln Cathedral.

The arcade is a favourite decorative feature in nearly all arcuated styles and especially in those of the Middle Ages. Thus, in the front of a Gothic cathedral there is very commonly a large arcade raised high above the portals and having each of its arches filled with a statue. In the well-known front of Notre Dame in Paris an arcade of twenty-nine arches comes immediately above the great doorways. Each of these arches is filled with a statue of a king or a queen, and the whole is known as the Royal Gallery, a term used in connection with other churches as well. High up in the front, above the great rose-window, is a second arcade of four great double arches to each tower and four similar ones between the towers; these last open and showing the peak of the roof beyond, while minor arches adorn the buttresses. This second arcade is on a great scale, the larger arches having about 8 feet span and rising 24 feet above the bases of their columns, while yet the arcade is purely ornamental, except in so far as it covers a narrow gallery for the caretakers or workmen.



Intersecting Arcade: Christ Church, Oxford. Close of 12th Century.

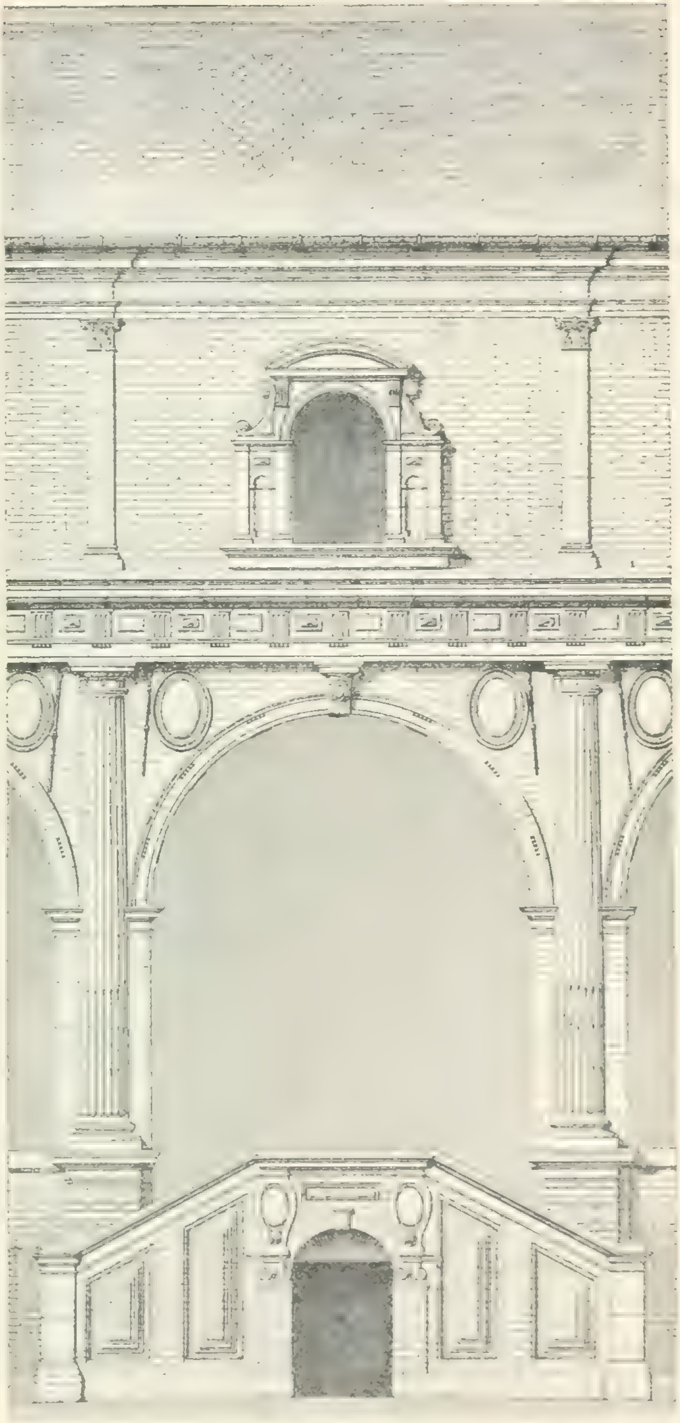
Similar arcades are used in the interior of Gothic churches and very commonly in English architecture. It is certainly a more dignified and worthy system of design when these arcades can be used to stiffen the walls which they adorn, and to a certain extent this is done in the Romanesque and Gothic work; still, however, the arcade is usually a purely decorative feature.

B. A single arched opening, with its abutment, etc.; rare in this usage, which is borrowed from the French; but occurring in carefully written matter, as when a Roman memorial arch is spoken of as having one, two, or three "arcades." (Cuts, cols. 107, 108.) — R. S.

Intersecting Arcade. In the Romanesque architecture of the North, one whose archivolts cross one another, being curved in imitation of interlacing bands. Many instances of this curious decoration exist in England; it is naturally limited to purely decorative arcades not large in scale nor deeply recessed.

Surface Arcade. An arcade or system of arches built against the surface of a wall, or partially or wholly imbedded in it, generally for decoration, as frequently in Romanesque and mediæval architecture; a blind arcade; called also Wall Arcade.

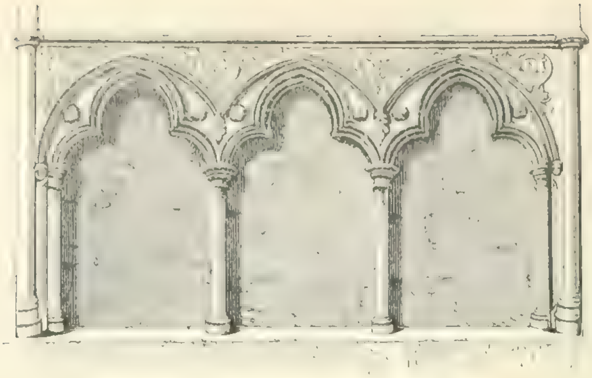
ARCADE (II.). In English, and forming part of a proper name, a covered gallery with shops or booths along its side. The Lowther Arcade and Burlington Arcade are well-known buildings of this sort in London. A very large building of this sort exists in Moscow, having been erected in the seventeenth century; in this there is an upper balcony connecting with several bridges which cross the open space; and a second row of shops opens upon this balcony. One in Milan is described under Galleria. There is no English name for this kind of structure, which is the nearest European approach to the Oriental Bazaar. Enterprises of the sort are not common, and neither in French, Italian, nor English is there a special name for them. (See Passage, II.)



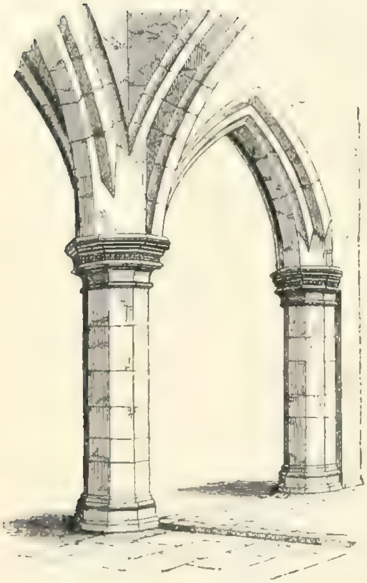
Arcade on Court, Hôtel d'Assézat, Toulouse; 16th Century.

ARC DE L'ÉTOILE. (See Arc de Triomphe.)

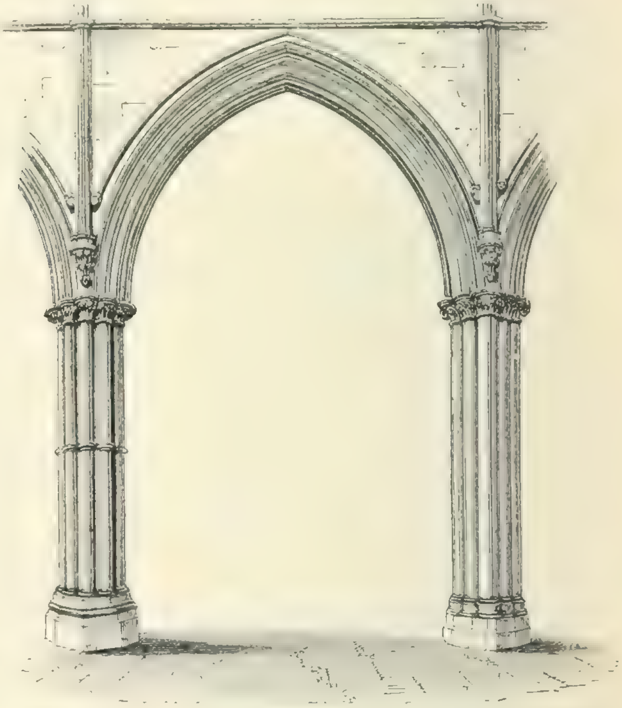
ARC DE TRIOMPHE. In France, a triumphal arch; a term often applied to certain special buildings [illegible] the Monumental



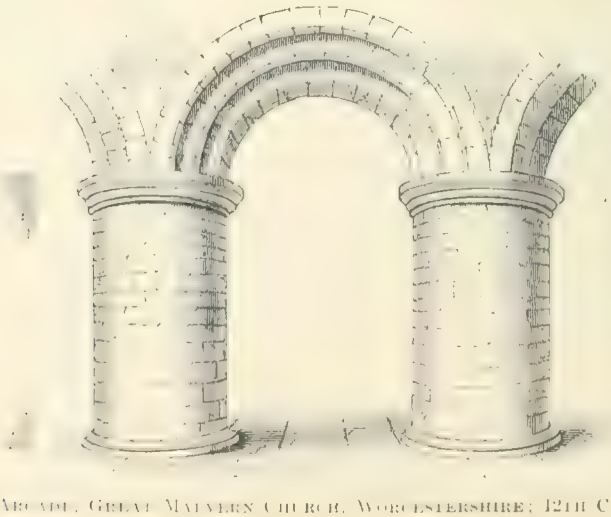
Surface Arcade, Stone Church, Kent.



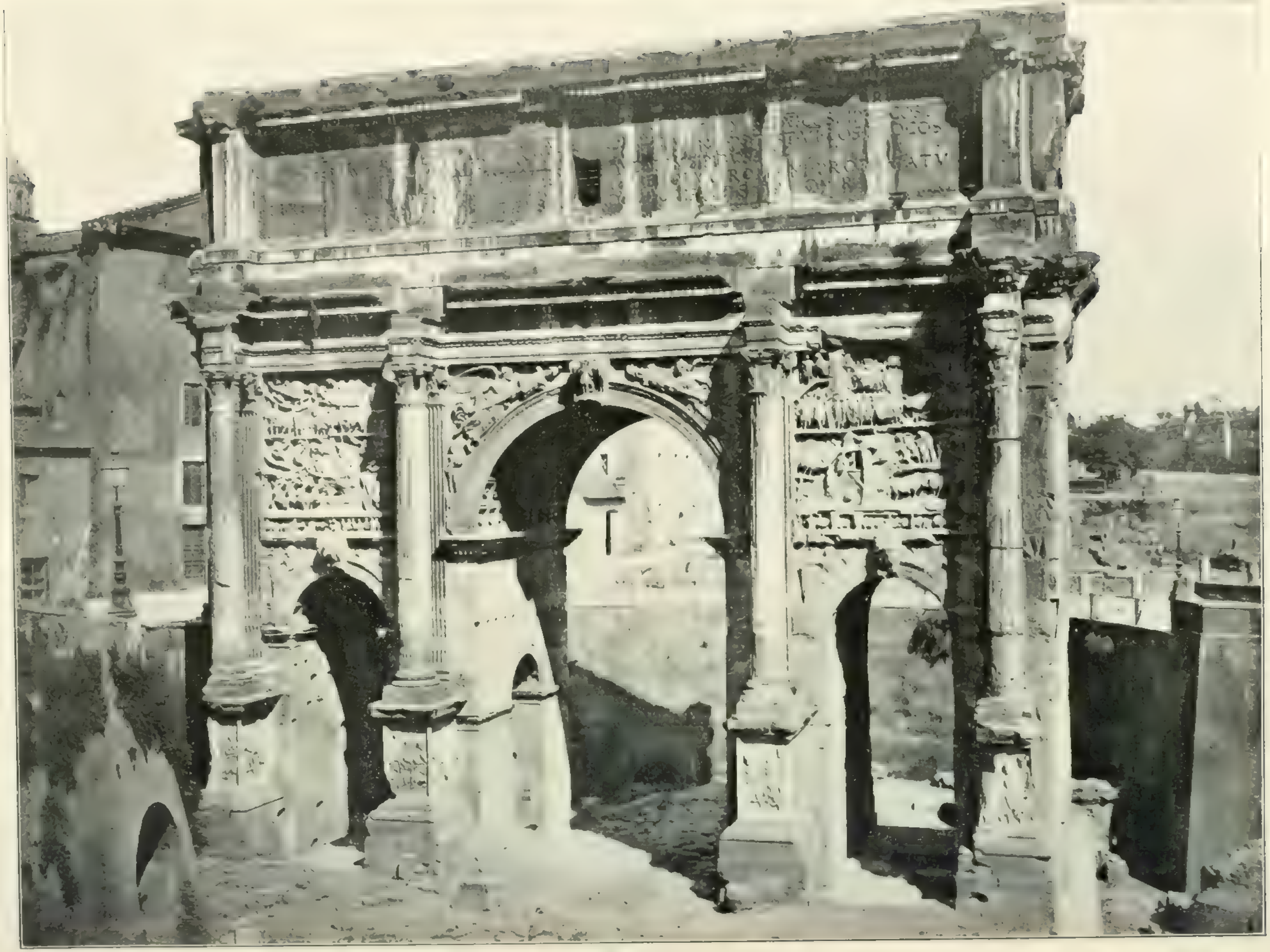
Nave Arcade, Barton Stacey, Wiltshire.



Nave Arcade, Lincoln Cathedral; Early 13th Century.



Nave Arcade, Great Malvern Church, Worcestershire; 12th Century.



ARCH OF SEPTIMIUS SEVERUS

At Rome, at the northwestern end of the Forum ; of white marble except the base, which is of travertine. It was built by the Senate in honour of the Emperor Severus and his two sons, Caracalla, afterwards emperor, and Geta, who was murdered. This work of the year 203 A.D. shows already a marked decline in the quality of the sculpture from that of Trajan, ninety years before.

Arch. The most famous is the Arc de l'Etoile ("of the star," or meeting-place of many streets) in Paris, begun by Napoleon I. and completed under Louis Philippe, except that the crowning sculpture was never added. Another is the arch standing between the Louvre and the former palace of the Tuileries called Arc du Carrousel from the old Place du Carrousel ("of the tournament").

ARC DOUBLEAU. (Pl. *Arcs doubleaux.*) In French, an arch, usually very massive, carried across a nave or other wide space, with the view of supporting a groined vault, or of merely stiffening a wagon vault, and, in some cases, of allowing for the more easy building of the centring. There seems to be no English term for this member; Transverse Arch (which see under Arch) has been adopted by some writers, but is inadequate. (See Vault; Romanesque Architecture.)

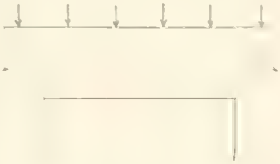
ARC DU CARROUSEL. (See Arc de Triomphe.)

ARC FORMERET. In French, the wall arch or wall rib, or the corresponding rib coming next to the arcade between nave and aisle, or the like, as in Gothic vaulting. There seems to be no English term which adequately describes the member in question.

ARCH. *A.* A structural member rounded vertically to span an opening or recess; in this sense the term is used either for a decorative or memorial building, of which an upward curving member forms the principal feature and spans a gate or passage below, or for the member itself, considered as a firm and resistant curved bar capable of bearing weight and pressure. In this, the original sense, a wicker device thrown across a street or passage and covered with foliage and flowers, is as much an arch as a more permanent structure. (See Memorial Arch; also Arch of Constantine, etc.; and Arc de Triomphe.)

B. A mechanical means of spanning an opening by heavy wedge-shaped solids which mutually keep one another in place, and which transform the vertical pressure of the superincumbent load into two lateral components transmitted to the abutments. The shape is indifferent, although arches are generally curved. The width or thickness, horizontally, is also indifferent, although an arch which acts as a roof and covers much horizontal space is called a vault.

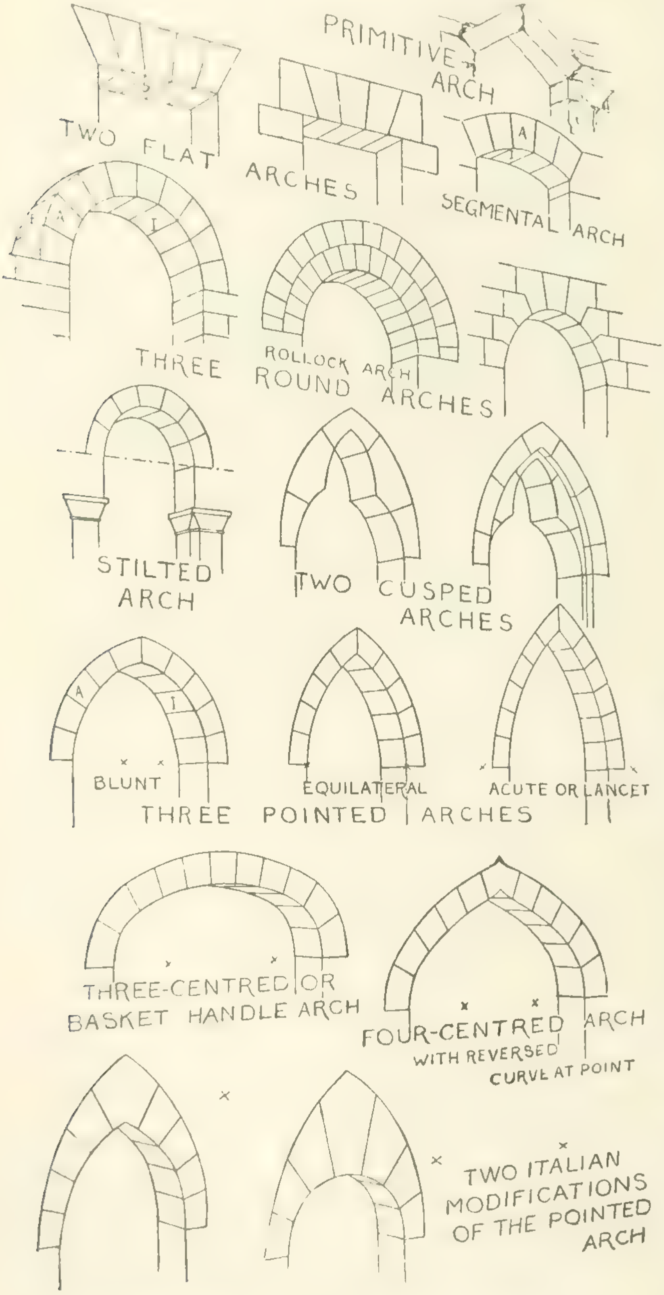
The constructional arch has been known from great antiquity, but it was rarely used by the ancients except for drains or similar underground and hidden conveniences. It appears, however, that the Assyrian builders used it freely as a means of roofing their long and narrow palace halls. (See Mesopotamia, Architecture of; and Vault.) Assyrian vaults were built of unbaked brick put together with mortar, so that the arch or vault became a continuous and massive shell. On the other hand, the Etruscans from a very early time understood the principle of the arch so well that they built arches of cut stone in large separate voussoirs put together without mortar. For us, the Etruscans were the originators of the true self-supporting arch. It was adopted from them by the Romans; but both these nations confined themselves almost exclusively to the semicircular arch, both in spanning openings in walls and for purposes of vaulting. The pointed arch seems to have been known as early as the round arch. It is, indeed, an obvious way of making an arch which shall have greater height in proportion to its width, and which shall in this way be stronger, because having less outward thrust. Its use in pre-Gothic building, as in early Mohammedan architecture, and in Romanesque buildings, as in S. Front at Perigueux, is merely occasional and because of some preference on the part of the individual builder. (For its use in Gothic Architecture see that term and Vault.) The three-centred arch and the four-centred arch are both much used in the transitional work of the sixteenth century in Northern Europe. The segmental arch has hardly been used for decorative purposes, except occasionally in the Louis Quatorze style, before the present half century; it is now rather common in French work, and it may be that more could be made of it, architecturally speaking, than in the past. The flat arch is used commonly to produce a similitude of trabeated construction when in reality the stones accessible are too small for the great spans required. Thus, in Roman and neoclassic buildings, the epistyle or architrave between two columns is often made of separate voussoirs in this way, as in the Pantheon of Paris. Mechanically, an arch may be considered as any piece or assemblage of pieces so arranged over an opening that the vertical pressure of the supported load is transformed into two lateral inclined pressures on the abutments. Considered in this light, then, the stone window head shown in Fig. 1 is truly an arch. The stone is wedge-shaped; and it will be readily seen that the load on it has a tendency to force this wedge down into the window opening by pushing the adjoining masonry away to the right and left, as shown by the arrows. An arch slightly more elaborate is the primitive arch shown in Fig. 2. Here two wedge-shaped stones lean against each other, and each one transmits pressures similar to those just described, the pressures at the respective upper ends counter-



ARCH, Fig. 1.

[illegible]

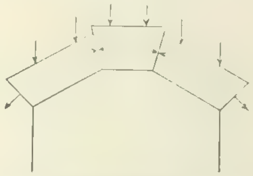
acting each other. This form of arch may be compared to a pair of rafters whose tiebeam has been removed and its function fulfilled by a weight at the feet of the rafters. To go a step farther, we have an arch made of three stones, as shown in Fig. 3, each one of which is acting as an independent wedge tending to force its way inward, and so exerting a lateral pressure at each of its oblique ends, while the combination of all these six pressures results in a lateral push on each abutment as shown by the arrows. This lateral push, in Figs. 2 and 3, is similar to that in Fig. 1, from which it differs in direction, owing to the inclination of the end pieces; were these more steeply inclined they would evidently exert a push more nearly vertical. Hence, the higher the arch in proportion to its span, the less lateral push will it exert.



Arch, Fig. 2.

[illegible] the same wall.

The foregoing considerations will be found to apply equally well to all of the arches shown in Fig. 2, or to any other similar construction of wedge-shaped pieces. It will also be observed that, in the case of two or more such wedges, each one is being acted upon by the adjoining pieces, which tend to force it outward; this tendency is overcome only by a proper and more or less uniform distribution of the loads to be carried.



Arch, Fig. 3.

The vertical pressures resolved into diagonal sideway pressures at the two abutments, and into reciprocal sideway pressures at the two joints between the stones.

The lateral pressure on the abutment is known as the thrust, and resistance to this force was the subject of constant experiment in the church building of the Middle Ages, resulting in the elaborate systems of engaged and flying buttresses. (See Vault; Buttress.)

Arches may be divided according to their form into the following classes: —

(*a*) The Flat Arch (which see below).

(*b*) The arch with one centre; (1) semicircular or Round Arch; (2) Segmental Arch; (3) Horseshoe Arch.

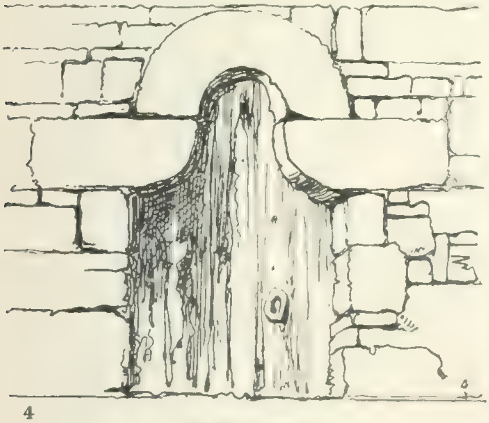
(*c*) With two centres; (1) Equilateral Pointed Arch; (2) Lancet Arch; (3) Drop Arch or Blunt Pointed Arch; (4) Pointed Horseshoe Arch; (5) Drop Arch in the second sense (see below). These five varieties are what is known as pointed arches; the first three being those in use in many styles.

(*d*) With three centres; (1) Basket Handle Arch; (2) the round arch with reversed curve at crown.

(*e*) With four centres; (1) that form of pointed arch in which two of the centres are on the springing line and two below; (2) that in which a two-centred arch is prolonged at top with a reversed curve (see Ogee Arch below).

It is evident that a six-centred arch might be composed by giving to the form (*e*) (1) a reversed curve as in the other instances; but such subdivisions may be continued indefinitely; thus a five-centred arch might be developed out of the basket handle arch; and so on.

An arch is divisible into the Haunches, or Reins, and the Crown. An arch is made up of Voussoirs, of which there may be one in the middle occupying the centre of the crown and called a Keystone. The inner side of the arch ring is called the Intrados. The outer side of the arch ring is called the Extrados, or back. When an arch is laid down on paper the horizontal line which passes through the centre in the plane of the arch, if there is but one, or which connects two centres, and which (except in the segmental arches, one- or two-centred) marks the place at which the curve of the arch joins the vertical line of the abutment, is called the Springing Line. The height from the springing line to the intrados (or to the line which in a drawing represents the intrados) is the height or Rise; sometimes called the versed sine. The width between the two points of juncture above mentioned is the Span. That part of an arch which forms a part of the face of the wall is called the face of the arch, or very commonly, the Archivolt. Parts of the construction immediately dependent upon or connected with an arch are the Abutment; Impost; Skew Back; Spandrel; Springer.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Bell Arch.

From a belfry in a Swiss [illegible] above Vevay.

(For the influence of the arch upon building and architectural design see Arcuate.) — R. S.

Abutment Arch. That arch of a series which comes next to the outer abutment; as the land arch of a bridge.

Back Arch. An arch carrying the back or inner part of a wall, where the exterior face of the wall is carried in a different way; as above a window opening, which has a stone lintel for the outer part of the wall and a concealed arch carrying the inner part.

Chancel Arch, Iffley Church, Oxfordshire; Middle 12th Century.

Basket Handle Arch. A three-centred arch of the more usual kind; see the illustration. The term might equally well be applied to a five-centred or seven-centred arch having the same general form.

Bell Arch. An arch resting upon two corbels with curved face or edge, so that the resulting compound curve has a distant resemblance to the outlines of a bell.

Built Arch. One composed of material other than masonry and put together with rivets, spikes, or the like; therefore not depending upon the mutual support of voussoirs, nor yet a solid ring of masonry. The simplest form is the Laminated Arch (see below). The more elaborate forms are more usually called by special names, as arched truss, or arch truss, and instances of this latter class are to be seen in such great interiors as the Grand Central Railway Station at New York, and in bridges such as the Washington Bridge across the Harlem River, New York City.

Camber Arch. Same as Flat Arch (see below), so called because a slight camber is given to the intrados, and sometimes to the extrados as well, a very slight camber. It is, of course, an arch with a scarcely perceptible segmental curve.

Catenarian Arch. An arch whose intrados or centre line is a catenary curve; extremely rare in architecture, though not uncommon in engineering.

Cloistered Arch. Same as Cloistered Vault (see under Vault).

Composite Arch. Same as Mixed Arch.

Compound Arch. *A.* Same as Built Arch. *B.* Same as Mixed Arch.

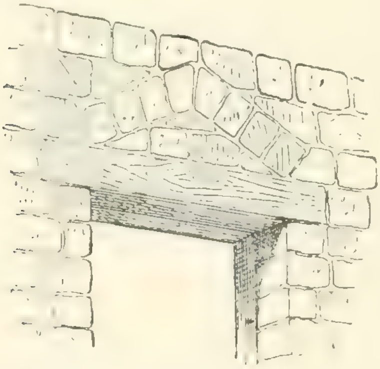
Contrasted Arch. An Ogee Arch, or one with a reverse curve.

Cusped Arch. One which has cusps or foliations worked on the intrados.

Cycloidal Arch. One whose intrados or centre line is a cycloid; a form thought to have been recognized in the architecture of India.

Depressed Arch. Same as Drop Arch.

Diminished Arch. An arch having less rise or height than a semicircle; whether segmental, multi-centred, or elliptical. The term is not in common use.



Discharging Arch over a Wooden Lintel.

Discharging Arch. One built over a lintel or similar closure or opening in a wall, and intended as an appliance for throwing the load above an opening to the piers on both sides and thus relieving the lintel or flat arch from the danger of being fractured or dislocated. In the case of an arched doorway, where there is a tympanum under the arch or a lintel with a glazed light above it, the arch is considered as the principal thing, and the lintel, or as it is sometimes called, the transom, as an accessory; and here the term "discharging arch" would hardly be used.

In some cases the discharging piece, of whatever nature, is concealed. Thus, in Roman and neoclassic buildings the architrave may be composed of voussoirs, and this flat arch may be relieved by a discharging arch, above each intercolumniation, and this may occupy the whole height of the frieze, which thus masks or even wholly conceals the discharging arch.

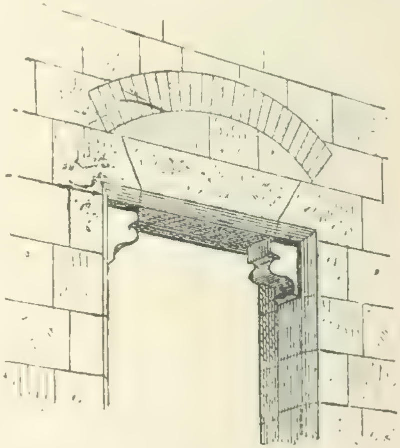
Drop Arch. (1) A pointed arch in which the two centres are nearer together than the width of the arch, so that the radii are less than the span. (2) One in which the centres or some of the centres are below the springing line, as in Basket Handle Arch.

Dutch Arch. Same as French Arch.

Elliptical Arch. (1) An arch the curve of whose intrados is an ellipse; this form is very unusual, probably because nearly the same curve can be reached by combinations of circular curves with three or five centres, and because such a curve is much easier to construct and to transfer. (2) A three-centred or five-centred arch, of which the Basket Handle arch is the more common form; evidently an inaccurate term, and to be avoided.

Equilateral Pointed Arch. (See Pointed Arch below.)

Extradosed Arch. One which has the extrados clearly marked, as a curve exactly or nearly parallel to the intrados, therein differing from an arch whose voussoirs are cut with horizontal returns so as to pass into the masonry of the wall. The extradosed arch has then a well-marked archivolt.



Discharging Arch over a Flat Arch, forming Lintel.

Flat Arch. One having a horizontal or nearly horizontal intrados, and, in most cases, a horizontal extrados as well. A flat arch with slightly concave intrados is called a Camber Arch. When built of brick the radiation of the voussoirs is effected in cheap work by the thickening of the joints outward; in finer work, by cutting or rubbing the brick to the required taper, or by the use of specially moulded bricks. Such arches are for square-headed openings and in fireproof flooring between steel or iron beams. Their transverse weakness and great thrust make them undesirable for heavy structural work, and in walls they are consequently often relieved by discharging arches. Fireproof floor arches are built of specially designed hollow voussoirs burned very hard, and capable of sustaining a heavy load up to seven or eight feet span. (See Fireproofing.)

Flat arches occur in Roman work both in brick and stone, relieved as above mentioned by discharging arches. A similar construction is much more common in Arabic buildings and to some extent in Turkish, being made a decorative feature, constructed with alternate voussoirs of dark and white marble ingeniously toggled together by cutting the cheeks into interlocking patterns, and pushing the voussoirs in from the front. In some cases this is a mere veneering, covering brickwork or rubble. Somewhat similar flat arches occur in the hoods and openings of some mediæval fireplaces. In Lincoln Cathedral is a stone arch, nearly flat, of over thirty feet span between the two towers of the front; but such examples are very rare.

The strongly projecting architraves over engaged columns, both in Roman and modern work, are often of several pieces cut to form a flat arch, and this is true even of architraves over free columns when these are too widely spaced for safety with monolithic architraves; but in modern architecture such joints are commonly cut merely for the appearance of stability, a concealed metal beam really sustaining the flat arch and its load. — A. D. F. H.

Foiled Arch. Same as Cusped Arch.

French Arch. A poor form of construction for forming a horizontal top to an opening by laying bricks on a slope of about forty-five degrees starting from a skew back at each jamb and meeting at an angle in the centre. Properly not an arch, as the joints of the brick do not radiate.

Groin Arch. (See under G; see also Groin Vault, under Vault.)

Groined Arch. Same as Groined Vault. (See Vault.)

Hand Arch. One turned without centring, usually by the aid of a board whose edge is cut to the required curve, and serving as a template.

Hanse Arch; **Haunch Arch**; **Haunched Arch.** One of which the crown is of different curve from the haunches, which are thus strongly marked; usually a Basket Handle or three-centred or four centred arch.

Horseshoe Arch. One in which the curves are carried below the springing line so that the opening at the bottom of the arch is less than its greatest span; see the general article above.

Imperfect Arch. Same as Diminished Arch (see also Scheme Arch). All these terms seem to arise in the fancy, natural to academic students of neo-Roman style, that all arches not semicircular are in some way incorrect.

Inflected Arch. Same as Inverted Arch.

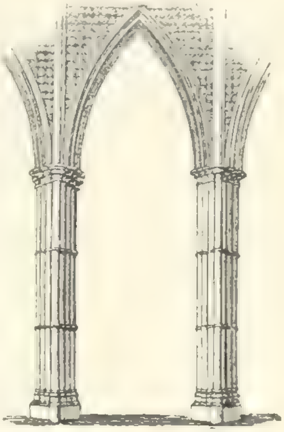
Interlacing Arch. (See Interlace.)

Inverted Arch. One whose springing line is above the intrados and the intrados above the extrados. Such arches are used in construction, as in foundations where very narrow piers have to be given a wider bearing upon the soil. The conditions are almost precisely similar to those of arches resting upon piers and with a superincumbent mass. In lofty modern buildings inverted arches are not common, as engineers prefer to give to each pier an unyielding and inelastic support. (See Base Course; Grillage.)

Jack Arch. Same as Flat Arch; also any arch doing rough work, or slightly or roughly built.

Laminated Arch. One built of thin pieces of material, such as boards, which are successively bent to the curve, each around the one below, and finally bolted or spiked together. Such pieces are laid so as to break joints and may be used ten or twenty thick in a single laminated arch.

Lancet Arch. A pointed arch whose centres are farther apart than the width or span of the arch; the reverse of the blunt pointed arch.



Lancet Arch, Westminster Abbey.

Land Arch. In a bridge or viaduct crossing a stream or valley, one of the two arches which come next to the bank and which spring from the exterior abutment.

Lobed Arch. Same as Cusped Arch.

Memorial Arch. (See the article under Memorial Arch; Triumphal Arch.)

Mixed Arch. An arch made up of curves struck from different centres and having an unusual form, such as the four-centred arch used in English Perpendicular work. The term has no technical value.

Moorish Arch. Same as Horseshoe Arch.

Oblique Arch. Same as Skew Arch. The term is also applied, but improperly, to a Rampant Arch.

Ogee Arch. One having a reverse curve at the point. The name is most often applied to an arch which has only two centres on the springing line (in this like an ordinary pointed arch) and two centres for the reversed curve; but many ogee arches have four centres for the arch proper and two for the reverse curve. (See Accolade.)

Ogival Arch. A pointed arch of the type most common in Gothic architecture; a loose English use of the French term. (See Ogive.)

Pointed Arch. One in which two curves meet at the crown at an angle, more or less acute. Ordinary two-centred pointed arches are called lancet or acute, equilateral, and blunt (see the subtitles which follow the article). Some Italian arches are of unusual form, with extrados and intrados not concentric. The pointed form is, like the round form, of unknown antiquity. Perhaps the earliest use of it as an important part of an architectural style is to be found in mosques, such as that of Tulun in Cairo (though it is asserted that the Coptic builders in Egypt used it from an earlier time; see Gayet, *L'Art Arabe;* compare Moslem Architecture and Egypt). It was used in Romanesque work in the West, though never very freely. When, therefore, the system of rib vaulting was in the earliest stages of its development, the pointed arch was ready at hand, a familiar expedient; and its utility under the new conditions became evident (see Gothic Architecture; and Rib Vault, under Vault). Adopted thus as a necessary part of the construction, it became also the characteristic decorative feature of the new style.

Acute, blunt, and equilateral arches were freely used in the same building; but the four-centred arches were not used until a very late time (see Tudor Arch below; also Elizabethan Architecture; Tudor Architecture). The two-centred segmental arch was a still later piece of decadence.

Raking Arch. Same as Rampant Arch.

Rampant Arch. One in which the impost on one side is higher than that on the other. Thus, in a stone balustrade for a staircase, the small arches supporting the hand rail spring upward from the top of one baluster to the top of another. The curve may be of any shape which allows of imposts being placed continually higher from one end to the other of the arcade.

Relieving Arch. Same as Discharging Arch.

Rollock or Row-Lock Arch. One in which the bricks or other very small pieces of solid material are arranged in separate concentric rings. Such arches are common in simple brick masonry; but engineers generally reject them.

Round Arch. One of semicircular curve; usually limited to one which is very slightly stilted, if at all, so that its appearance is of a semicircle and of no more, above the imposts. This form is the only one used in Roman Imperial, Byzantine, Romanesque, and cognate styles, as well as much the most common form in Renaissance and Post-Renaissance architecture. These are often classed together, roughly, as the Round-arched styles.

Safety Arch. A discharging arch; an arch thrown over a lintel to relieve it, or under a bearing to distribute it over a larger surface of wall.

Scheme Arch. Same as Diminished Arch. The term seems to be derived from the Italian *scemo*, "diminished" or "lowered" (see Imperfect Arch). Spelled also *Skeen.*

Segment Arch; Segmental Arch. One having for the curve of its intrados and extrados concentric segments of circles and whose centre, therefore, is a certain distance below the angle made by the impost with the inner face of the abutment, such as the jamb of a door or window.

Semiarch. An arch of which only one half of its sweep is developed; as in a flying buttress.

Skew Arch. One in which the archivolt on either side is in a plane not at right angles with the face of the abutment. Thus, if a doorway is carried through a thick wall in a direction not at right angles with the face of that wall, the arched head of that doorway would be called a skew arch, being really a barrel vault whose axis is at an oblique angle with the face of the wall.

Splayed Arch. An arch opening which has a larger radius at one side than at the other. As was said above of the skew arch, this is a vault rather than an arch proper. An accurate term for it would be conical vault.

Stilted Arch. One in which the architectural impost, with its mouldings, abacus, string-course, or the like is notably lower than the springing line; so that the intrados passes into the vertical jamb of the opening, and this is continued downward as if a part of the intrados. The whole archivolt follows this form.

Straight Arch. Same as Flat Arch.

Straining Arch. An arch used as a strut, as in a flying buttress.

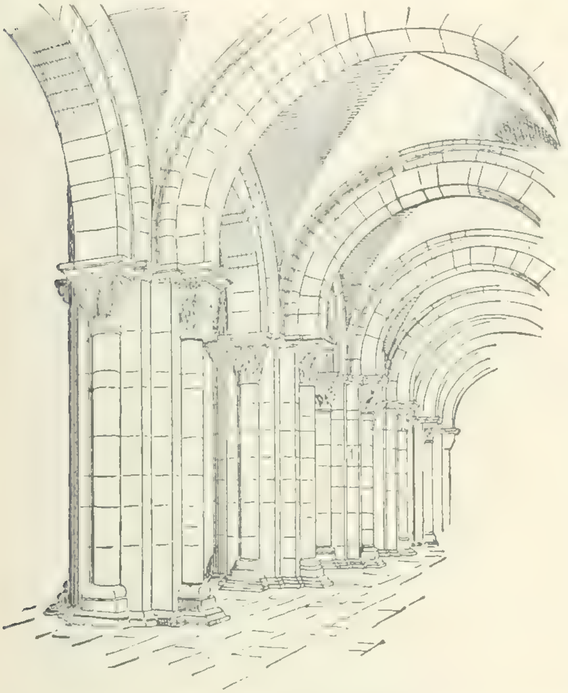
Subarch. One of two or more minor arches beneath and enclosed by an outer arch, as in Gothic tracery, or in the simpler forms of Italian domestic architecture.

Surbased Arch. A depressed arch; an arch of which the rise is less than half the span.

Surmounted Arch. A stilted semicircular arch; a semicircular arch of which the centre is above the impost.

Three-lobed Arch. One of which each haunch is developed into a cusplike form; so that the archivolt itself, if there is one plainly distinguished, or the intrados alone, assumes the form of a trefoil. The form with a complete archivolt is rare, but occurs on a large scale in the Cathedral of Tournai. The form where the intrados only is three-lobed occurs in many arcades, usually small, of the thirteenth century.

Transverse Arch. The arched construction built across a hall, the nave of a church, or the like, either as part of the vaulting or to support or stiffen the roof in some other way, or to furnish a solid substructure for the centring. In Romanesque vaulting, the transverse arch (see Arc Doubleau) is hardly of use, except as an assistant in fixing the centring, but the timid builders of the time preserved it as a possibly needed aid, especially in the building of groined vaults. In Gothic vaulting it is the rib which crosses the nave, aisle, or the like, and divides the vaulting into compartments. Where there is no vaulting, an arch is sometimes built across the interior, carrying a wall which supports the purlins and other longitudinal timbers of the roof. (For this usage, see illustration to Refectory.)



Arch: Transverse Arch.

South aisle of the abbey church, Vézelay; transverse arch dividing the compartments or vaulting squares.

Triangular Arch. *A.* The corbel arch of the Maya; so called by Stevens. (See Corbel Arch; Central America; Mexico, Part I.)

B. A structure composed of two stones supporting one another mutually so as to span an opening. (See Arch.)

Trimmer Arch. An arch usually of brickwork and of very low rise, built between the trimmers where a floor is framed around a chimney breast. Its thrust is taken up usually by the stiffness of the header on the one side and by the brickwork of the chimney breast on the other. Its purpose is to support the hearth of the fireplace in the story above.

Triumphal Arch. (See Memorial Arch.)

Tudor Arch. A four-centred pointed arch so called because common in the architecture of the Tudor style in England.

Allan, Professor W., *Theory of Arches*, New York, Van Nostrand, 1890, 12mo.; Cain, William C. E., *Voussoir Arches applied to Stone Bridges, Tunnels, Domes, and Groined Arches*, New York, Van Nostrand, 1879, 1 vol., 12mo.; Choisy, *L'Art de Bâtir chez les Romains*; Violett-le-Duc, *Dictionnaire de l'Architecture*, see under *Construction; voûte, arc*. See also Building, Bibliography.

ARCHAIC. Pertaining to or having the character of extremely early and primitive work. As applied to different branches of art, the term refers to different but specific periods; as, for example, in Greek art, to the formative period between the Heroic or Homeric Age, and the middle or end of the sixth century B.C. Archaic is distinguished from primitive art by its evidence of those definite progressive tendencies which give form to the later and more perfect art.

ARCHAIC SMILE. The peculiar expression of mouth and eyes, resembling a smile, which characterized early Greek sculpture of the human face down to the close of the sixth century B.C.

ARCHAISM. *A.* A lapsing into the style of a long-past age or period, whether intentional or involuntary.

B. The product of such a reversion to an extinct style or practice.

ARCH BAND. Any narrow elongated surface forming part of, or connected with, an arch; whether an Archivolt or forming part of an Intrados; a term used by masons.

ARCH BRICK. A brick belonging to, or prepared for, an arch; particularly one especially moulded, cut, groined, or rubbed to fit its place in a given arch.

ARCH BUTTANT. Same as Flying Buttress; a misuse of the French term *arc boutant*.

ARCH BUTTRESS. Same as Flying Buttress.

ARCHER, THOMAS; architect; d. May 23, 1743.

He was a pupil of Sir John Vanbrugh and executed under his direction the Church of S. John the Evangelist, Westminster. He built also the Church of S. Philip at Birmingham (England). Several of his edifices are illustrated in Campbell (op. cit.).

Walpole, *Anecdotes of Painting*; Campbell, Vitruvius Britannicus, *Arch. Pub. Soc. Dictionary*.

ARCHING. *A.* The operation of building an arch or of shaping into the form of an arch.

B. A system or series of arches; arched construction.

ARCHITECT. A man charged with the preparation for a building, its plan and design, and with the supervision of the work of the builders who actually put it up and finish it. Obviously, an architect may be charged with any part of this work, and may leave it to another at any stage of the proceedings. The man is equally an architect who, having undertaken the task of carrying the whole building [illegible] closed, the drawings made, and the main lines are staked [illegible]. Equally is he an architect who, taking charge of a building nearly finished, carries it to completion, including its decorations and final preparation for use. The term signifies nothing more than head workman or director of the workmen, and the exact duties of the architect vary with the epoch, the country, the kind of building, and the wishes of the owner.

In many countries and many ages building has been so much a matter of tradition, every part of the structure being so fixed by rules or by customs which no one dreamed of violating, that a priest or a high officer of the court was more nearly the architect than any one else, because he employed without intermediary the masters of gangs of workmen and, perhaps, even the workmen themselves directly. Thus, it is not probable that any person having charge of the whole building stood between an Egyptian priest and the builders of the temple with which he was especially charged. Exact knowledge of these matters is not now procurable; but it is probable that very precise formulas governed the planning of pyramids and temples. Even in a time and place as well known in comparison as Athens under the rule of Pericles, we learn that Phidias (see Phidias) managed everything and was "overseer in all the work" undertaken in Athens, but we have no knowledge of his immediate share in this work. We are told that Ictinus (see Ictinus) was the architect of the Parthenon; but again we do not know how far he was the designer of the building, how far it was he who determined the extraordinary refinement of measurement, of curvature, and of proportion which the building manifests, and whether he did the placing of the sculpture. All our information upon these subjects in antiquity is vague because of the real indifference of those classic authors whose writings we still possess as to works of art in their detailed character. There was little sympathy among literary men with the work of the sculptor, painter, or builder of decorative buildings, and works of art were considered as objects for which, indeed, guidebook knowledge might be furnished, but concerning which no critical examination was undertaken. Even in times of the Roman Empire when organization was carried very far, and the great officers of the government were men of rank and influence, we have only names without other details as to the men in charge of the most important works. Cossutius (see Cossutius) is named by at least four ancient writers as the architect who began to rebuild the temple of Olympian Zeus at Athens 168 B.C., and Apollodorus (see Apollodorus) of Damascus is named by two ancient writers as having been employed by Trajan, early in the second century A.D., on the works of his great forum and basilica in Rome and the famous stone bridge over the Danube; but it is wholly uncertain what this artist's share in the work really was, what his authority was, how much responsibility he had, and, therefore, how much credit he deserved for the beauty and utility of the buildings. It is not known how he was paid, nor whether his control of the building extended beyond administration, that is to say, whether he was expected to furnish designs for sculpture and painted detail, or merely to see that such details were provided and paid for. There is, indeed, doubt of this sort connected with the directing builders, or, as we may call them, the architects of the earlier Middle Ages. We know that, in the time of S. Louis, Pierre de Montreuil (see Pierre de Montreuil) was the architect of the Chapel of the Virgin at Saint Germain des Prés, where he and his wife lie buried, and it is thought that he was also the man employed by S. Louis upon the Sainte Chapelle. It is not until we reach the thirteenth century that even such information as this is available, and not until a century later that much can be learned concerning the position and duty of the architect, and this because building traditions and skill in building were in a sense the property of associations of workmen. Some one, indeed, must have been employed to take general charge of a proposed new church, must have supervised the laying of the foundations and have directed the character of the structure; and this officer was undoubtedly paid by salary and by certain privileges accorded to him. In the fourteenth century we find this to be the case. A salary small in our eyes is helped out by the privilege to employ a certain number of apprentices upon the work, whose services were paid out of the fund for the building, thus increasing the master's gain, and also by exemption from imposts, or by the free use of a house, or the like. Lorenzo Maitani (see Maitani) was appointed, toward the close of the thirteenth century, chief master builder of the works upon the newly undertaken cathedral at Orvieto, but he did not at once remove from his native place, Siena. He must have sent drawings; perhaps, also, models, for we know little of the means employed by the designer to convey his thought to the workmen. Twenty years later Maitani was persuaded to settle in Orvieto with a monthly salary of twelve florins of gold, and leave to bring scholars with him with permission to wear such heraldic bearings as he might select, and with exemption from taxes. For twenty years more he exercised supervision over the work of the cathedral, and then died at his post. (See *Travel and Study in Italy*, by Charles Eliot Norton.) An architect so employed would naturally remain in charge of a large church for a number of years, directing first the masonry walls, then the vaults and roofing, the filling of the windows with glass, etc., and all the time seeing to the preparation of statues, sculpture in relief, and the more architectural details which, however generally they may have been designed by certain subordinates, according to certain well-known principles hardly to be deviated from, were still to be completed to the satisfaction of the man in control.

With the appearance of the neoclassic styles of building in Italy in the fifteenth century begins also the era of individual fame for the architect, comparable to the individual fame accorded to the sculptor or the painter of mural pictures. Alberti (see Alberti) is looked upon as the architect of this or that building which is assumed to have been designed by him, in the years between 1430 and his death in 1472; just as Donatello (see Donatello) is looked upon as the sculptor of a bronze statue ascribed to him. Alberti was not a builder nor sculptor by trade, but a scholar and student of Roman literature, one of the promoters of the revival of learning, and he turned his attention toward the investing of architecture with what he thought to be Roman spirit, much in the same temper which his contemporaries showed in writing what they took for Ciceronian latin. A half century later, when the Duchess Margaret of Austria wished to build the monumental church in a suburb of Bourg en Bresse in the southeast of France, a painter, Jean Perréal (see Perréal, J.), called Jean de Paris, was chosen for the work; but, as has been pointed out by a writer in the *Gazette des Beaux Arts*, there were endless quarrels and disagreements as to the duties to be performed by the architect, and the reward and the merit of the design both for the church itself and for the astonishing tombs which it contains is still left unappropriated, claimed at once for Jean de Paris and for the local master mason. Afterward, when Jean de Paris had to go to Italy with King Louis XII., in whose court he held the position of *valet de chambre* to the king, Margaret of Austria appointed a Flemish master of the works, Louis Van Boghem. That position of "valet" continued to be occupied by men of art and letters even as late as the time of Molière, a fact which illustrates the extreme difficulty there is in comparing the titles of officers and employees in even such not widely separated ages of the world as the seventeenth and nineteenth centuries. The building we are considering is the Church of Brou (which see under Church; and consult Henri Havard, *La France Artistique et Monumentale*; and R. de Maulde la Clavière in the *Gazette des Beaux Arts*, 1895–1896). What is noticeable in all this is the absence of any professional position for the architect. He is a painter and designer of decorations for great festivals, like Jean de Paris; or a scholar with a taste for making studies of Roman triumphal arches, like Leo Battista Alberti; or a practised builder and sculptor, like Maitani; or, like the great Brunellesco (see Brunellesco), a man hesitating between sculpture and building, but gifted with so great a genius for novel construction and with so great a courage of his convictions that he forces his service upon the trustees of the Cathedral of Florence and builds for them that astonishing *tour de force*, the great masonry dome bearing the stone lantern which is in itself a very massive building eighty feet high. Even in the seventeenth century, Sir Christopher Wren (see Wren) was not by profession an architect, but a mathematician with many of the tastes and habits of a retired scholar; it took the great fire of London to bring him forward as the only man whom the king and the citizens would trust implicitly. Perrault (see Perrault, Claude), who designed the beautiful colonnade of the Louvre, was not by education an architect, but a physician, and his design carried it even over the immense reputation of Bernini (see Bernini), and over the position brought to Bernini by the fact that the king had invited him especially and at great expense from Rome to Paris.

It is evident, however, that a great step toward a peculiar position, a specialized professional status, was taken by the architect during the classical revival of the fifteenth century in Italy and the sixteenth century in France. This came of the partial disappearance of the traditional ways of building and the demand made upon the architect, in the case of each new building, for a wholly new set of details, all in accordance with one another and with the general design; details which for the first time were unknown to, and not to be furnished by, the workmen, but had to be drawn or modelled by the chief, who alone was cognizant of the new laws supposed to be derived from ancient Roman practice. From that time to the present day every building of importance may be said to have had an architect who is considered to be the artistic designer fully as much as the constructional engineer.

In very recent times the architect has become primarily the fiduciary agent whose business it is to administer the funds committed to his charge. The modern architect is equally in his right place and doing his work as architect when the building in hand is wholly without artistic character as when it is rich and beautiful. The New York Chapter of the American Institute of Architects supplies the following definition: "An architect is a professional person, whose occupation consists in originating and supplying artistic and scientific data preliminary to and in connection with the construction of buildings, their appurtenances and decorations; in supervising the operations of contractors therefor; and in preparing contracts between the proprietors and contractors thereof." It is to be noted, however, that the word "artistic" is not always applicable; for a man of business wishing to have a perfectly plain factory, mill, or warehouse thoroughly well built will, today, naturally employ an architect as the intermediary between himself and the builders. Even when such a piece of work has to be done as the arrangement of what are called vaults under the sidewalk of a city building without the slightest pretence of architectural arrangement, the architect will still have to be employed and will still earn his pay.

It is probably on account of this businesslike aspect which the pursuit of the architect has put on, that the architect's position is often regulated by law; that examinations have to be passed and licenses obtained before one can practise; see, however, the contrary practice in France (see Architect, The, in France, below) where severe laws as to the failures of an architect replace the system of authorization. It is for this reason also that payment is now generally made by percentage on the cost of the work. Practically, in all the countries of Europe and in the United States, a payment is made based upon the theory that five per cent on the cost of the work is proper remuneration for the architect who has had full charge of the work, furnishing the drawings and superintendence and completing the building. Frequently the charge is higher than this when the work is elaborate and involves great labour on the part of the designer in proportion to its money cost; on the other hand, the charge is often less when the work is very costly in proportion to its elaboration of design. Very small buildings, too, are often charged at a higher rate, chiefly on the theory that an architect could hardly afford to design and superintend a summerhouse or boathouse for $50 even if the cost of the building did not exceed $1000.

It is necessary, however, to explain in detail the way in which the architect does his work at the present time; and the practice in other countries does not differ so greatly from that of the Eastern states of the United States that one description may not serve for all. The architect, having received notice from the owner that he is employed for the work, makes some preliminary studies in consultation with the owner, visits the ground, decides upon the exact placing of the building, except in the case where it has to occupy the whole, or nearly the whole, of a city plot, employs a surveyor in the latter case to give him the exact points beyond which no parts of his building may project, and then begins to make drawings. An architect in a small way of business may make all the drawings himself, having perhaps a draughtsman at small pay to make tracings from them on transparent paper or cloth. An architect in a large way of business, or a large architectural firm, has many draughtsmen employed, some at high pay and in responsible positions. (See Drawing.)

Beside the drawings, the Specification has to be made. The contract is also drawn up by the architect who usually has a printed form by him to fill up. (See Contract.) The work then beginning is carried on successively by excavator, mason, contractor for iron work, carpenter, roofer, joiner, plumber, gas fitter, and the like, all of whom work under the architect's direct supervision, or under the supervision of some one replacing him. (See Superintendence.) It is generally understood that no money is to be paid by the owner to any of the mechanics except on the written certificate of the architect; and, on the other hand, it is generally understood that the architect is bound to give that certificate when it is due, and that the owner owes the money and should pay it immediately upon the presentation of the certificate. This fact is worthy of notice because it happens not infrequently that the owner will say to the architect that he does not want to have any certificates presented during the current month, or not more than $20,000 in any month, or something of that nature. It is clear that whether the architect can comply with this request or not depends upon the rate at which the work is proceeding, and that the architect cannot always yield to what is after all the mere asking of a favour. The architect, although employed by the owner to see that the work is rightly done before he pays for it, is still in the position of a man who must see fair play between the two contracting parties, and the reasons why he is employed and paid exclusively by the owner of the property are that not he, but the builder, is engaged in doing the work, and that every one knows by an instant's glance whether the check offered him in payment is correct or not, whereas only an expert, and one constantly employed in watching the building, can know that the work done is a proper equivalent for the money payment to be made. In fact the terms of the contract generally make it plain that the architect has as clear a duty to see the contractors paid in full and promptly as to see that they do their work according to the terms of the agreement.

Alterations do not differ from new building except as to the necessity of measuring in advance and careful examination of the old work which is to be altered. An extra charge is sometimes made for this preliminary survey.

Restorations of ancient buildings thought important as architectural monuments are treated under the term "Restoration."

In some European countries the architect has very special duties as surveyor, appraiser, and the like — duties recognized by government and regulated by law. Thus, in England, there is business for a number of architects in valuing glebe lands, houses, and other property held in turn by different incumbents of a rectory or other position occupied by a clergyman of the Church of England. When the last previous incumbent entered upon the property, a survey and valuation of it was made, and now that he leaves it another survey is made because of the great necessity there is to estimate the improvement or the deterioration of the property while in the late incumbent's hands. In France the bill sent you by a mechanic who may have made alterations or repairs in your house, may be submitted to an architect whom you employ for the purpose, not having previously employed him to plan or direct the alterations in question. It is his professional duty, in which he is supported and controlled by law, to see that this bill is correct before the owner of the house can be compelled to pay it. (See the articles which follow, Architect, The, in England, etc. ; also, Bill of Quantities, Building Surveyor, and the terms referred to in the course of the above article.) — R. S.

ARCHITECT, THE, IN ENGLAND. From the point of view of those who employ him, the architect is a professional adviser and assistant in all matters pertaining to buildings, an executive officer, whom they appoint to exercise for them authority, and duties, of artistic, practical, and economic nature. (See Architect.) On the other hand, some would require that an architect should be a student of a traditional cult whose mission it is to engraft upon the outgrowth of the living world as much as he can of a past archæological flora, even at the sacrifice of some of the more modern tendencies, and to maintain academic dogmas as long as possible, although the fact that previous similar dogmas have been abandoned indicates that such can only be temporary.

This latter definition is really the extreme of the creed toward which much academic training tends. One of its products is "the battle of the styles," in which each side not only claims to be right, but absolutely anathematizes the other. It is quite naturally so. Schools must be conducted by men who devote more time to the traditional art than to the practical. They often build up for themselves standards and precedents and methods out of touch with the greater world for which they primarily exist.

Art is a reality, and is greater and higher than her devotees have ever said. But she should be our familiar friend, visible in every work of every day, and therefore must descend to everyday matters. It is necessary that art in architecture should be ready and able for the opportunities which daily occur.

The English system of architectural education, while it leaves much to be desired, has great advantages in that its fundamental principle is that academic study shall be subordinated to, and coincident with, actual work under a practising architect. The student thus learns at one time the purpose and the profit of his studies. His wants and the satisfaction of them occur to him simultaneously.

There are possibilities in this system which have not yet been fully developed, partly because the academic course has even in England maintained too separate an attitude. Let us examine it in detail.

The origin of the system is the apprenticeship, which sprang from the customs of Guilds, in which all skilled labour was organized in the Middle Ages. In Elizabethan time it was still unlawful to follow any occupation until after apprenticeship. The articles of apprenticeship therefore were not only a promise to teach, but also an admission to a close corporation, with its privileges to practise. But these restrictions, after much curtailing, were finally repealed in the reign of George III., so that now the privileges are unofficial or private, and largely fictitious. Still, the form of apprenticeship survives for its other real advantages, and the architect in English practice who has not passed through it is rare. It is usual for a pupil to engage with a master for three years, paying a premium which he receives back as salary in the latter part of his term. But the many branches of study which have no place in the office routine of an apprentice have to be provided for. These at first very appropriately fell to the care of those societies which had been constituted for the conservation of the higher interests of the profession. The Royal Institute of British Architects, and the Royal Academy of Arts, have long given some facilities to students in these departments, and in a more general way The National Art Training School (at South Kensington and numerous branches) has assisted. The universities and colleges have also contributed in various courses toward the same ends, and more recently the New London County Council has included technical education in its progressive programmes. But with all of these independent and scattered opportunities it could be hardly claimed that there was a system until the Architectural Association, by patient continued effort, established a real school of architecture in comprehensive form, and secured harmonious action with some of the other older societies.

This Association, constituted in 1847, was, and is, one relying upon coöperative effort of the students themselves. More liberally inspired, more accessible, and more practical than the senior bodies, it speedily became useful. Its early efforts, chiefly in freely contributed papers and classes of mutual criticism, reached a established [illegible] twenty years ago, and lately have developed into a systematic four years' course intended to supplement the training acquired in the offices where members are engaged as pupils or assistants. The fees are moderate, ten guineas each session, and the work is almost entirely arranged for evenings. The list of lecturers and instructors includes the most able men of the time, and the old system of honorary "Visitors" (seniors as critics) is retained.

There are certificates, medals, and prizes, and beyond these the course leads up to that of the Royal Academy of Arts with its further lectures, medals, and scholarships, and to the examinations and graduation in the Royal Institute of British Architects, which is the legitimate climax of any architectural training in England. The passing of this examination is now a preliminary condition to membership in the Institute. But apart from this fact the Institute examinations are really the natural sequel to the Association course, and with the present cordial relationship between the two societies may be considered as a single system.

The curriculum at King's College, London, spreads over three years, a course of study also intended to lead up to the Institute examinations, arranged in three terms for the year, and occupying practically all the time of the student. It claims, however, that this work is intended to prepare students for admission to an office or to supplement their work there. But three years is a long time for the student in architecture to double by taking successively what he can do simultaneously. It is not surprising, therefore, that the Institute itself sustains, by quoting in its journal (October, 1892) the opinion that "the course of education now provided by the Association is substantially that most suited to the majority of students." It is gratifying, too, to note the following passage in the same place. "The constant aim of all Association endeavours is to develop originality and individuality in its members, and the fact that its government, and to a large extent its actual tuition, is in the hands of comparatively young men, is a complete safeguard against any tendency to rigidity or formality, either in its methods or its teaching." The curriculum of the A. A., in four divisions, contains all the subjects generally set down as essential to a full course of study as taught by the schools. English architecture claims perhaps a large share of the historical course, but this is inevitable. Practical matters, construction, sanitary science, etc., are fully and intelligently handled.

A student of architecture in England has abundant opportunity for systematic work. After a good general education he may commence with the Institute "preliminary examination," by which he enters himself as a probationer, and a trial term in an office. Then, probably being articled in deference to time-honoured custom, he may enter the Association and take up the curriculum as a four years' course, requiring four evenings a week for eight months of each year, one evening at lecture, or class, one in preparation for same, and two evenings in the studio. He may, of course, spread the work over a longer period, or perhaps shorten it somewhat. After two years he may pass the intermediate examination. (The examination is divided in order to avoid the strain and "cramming" encouraged by one long continued ordeal.) After four years he may take the "final" or qualifying examination. All this time he has been at regular work as either pupil or "improver" in an architect's office. He will then usually make a change to some other office in a more responsible position, perhaps he will continue his Association work, possibly it is not completed, or the examination not successfully passed. If he has still the energy and pluck for evening work, he may enter the Royal Academy, of which the Architectural School is artistic only (omitting science as such). The course is valuable, the lectures and the practice of more advanced design especially, but the greater number of students there have in mind the medals and scholarships. The principal prize is the gold medal and foreign travelling studentship, which (together) are awarded every second year. The course, Probation, Lower School, and Upper School, takes five years. It would be very much better if this course could be brought into more harmonious working with the Association and Institute programmes so as to permit of its being taken by the same students without the excessive waste of time. At present it does not form a necessary part of the unified scheme, which may be called the English system of architectural education, and which may be summarized as the office work, the Association classes, and the R. I. B. A. examination.

The best results of the above described system are yet to be seen. The architecture of to-day is being done by men who enjoyed only the less perfect beginnings of the system, when it was being evolved from their experiences.

There are great possibilities in it. It should turn out practical architects. It avoids, to some extent, that pitfall of youth, the self-satisfied period of collegiate graduation, from which the reaction upon entry into the real world is so demoralizing. It keeps the actual living work and the revered traditions in touch without allowing either to extinguish the other. It is above all others a practical system, having grown out of necessities and not out of theories. To Americans it promises better results than any other, because of its cooperative decentralized methods. The examining power is the only one claiming authority; all the educational routine is free for self-organization.

It might be an advantage to decrease the quantity of night work. It is of course desirable that the man who lives by his practical office work should have facilities for evening study, and these will always be the best students. But it undoubtedly would be better if a pupil, who has entered an office for the purpose of education, could devote at least two afternoons each week to his Academic work. That would leave still two evenings of work. It is discouraging to some students, especially those whose means permit them free choice, to have to do such hard work as the English course requires; and it can well be argued that the standards of the profession could be depreciated by making its preliminaries so exacting as to divert many from its doors. The student should not be required to sink his whole individuality in the routine of a course. He will have his favourite special subjects, and should be allowed some time and opportunity for them, as well as for the ordinary social and intellectual pursuits of youth.

The whole course of routine work should not necessarily exceed four years, with perhaps some post graduate work under the stimulus of the grand prizes. It should be possible for the student to complete his collegiate education before entering the strictly technical, and still complete the latter before the age at which it is necessary for a man to begin his individual career. Allowing a year for travel and for the process of establishment, this would reach the age of twenty-four or five, none too early for the commencement of a professional career.

While reducing the time demanded, further improvement might be made in the character and scope of the examinations. The tests should be more nearly such as prevail in actual practice. In design, for example, it is injudicious to require a student to design a complete building in a day without any previous notice of the subject. Every sensible architect would wish (and in practice would be able) to think a week or a month before he attempted expression, and he would consult many precedents and authorities. For an examination in design, therefore, the subject should be announced two weeks, at least, in advance, and access permitted to any works of reference which would be proper in an architect's office. Criticism of, and awards for, design should be on broader and more enduring grounds. The fashion prevailing is not always the highest art, nor the fashionable architects the highest judges.

In constructive science, too, although the student should show a knowledge of the principles upon which ordinary formulæ are constructed, it is not necessary that he should burden his memory with them.

The graduates in examination should be allowed all the usual books of tables and formulæ in general use. They are few enough. Then the questions and problems should be real ones, not ingenious tests of a pedantic memory. Many men who cannot trust their recollection for a single formula or constant, are yet able and expert under fair conditions; indeed, the man who never trusts his memory is the one who makes fewest mistakes. The architect who knows just where to find tabulated results, and how to use them, is better equipped than a mathematician who befogs his simplicity of view in a laborious mass of detail.

Much more force is added to this argument when the examination is one for qualification, to which men already in active practice are entered. A thoroughly competent man may, nay does, look upon a test of the usual kind with dislike and distrust simply because of its pedantic and unreal demands. This should not be. All such examinations should represent as nearly as possible the conditions of actual work. Conducted in such a way it seems that this system of standard examinations, by a central body with authority, of students who have been following a course of study under independent educating institutions in which variety may be permitted to great extent, is the most promising method of architectural education. It may be added that the standard for graduation should not be so high as to be discouraging. If it is more difficult than the tests of actual work, it cannot be enforced. An architect who can with the available tables properly proportion his beams, girders, and columns, and can also by graphic methods make analysis of strains in ordinary trusses, arches, piers, etc., can do all that the average architectural practice requires in this department. For graduation no more should be required; an "honour" degree may be given for higher attainments, but these highly ranked students will not always be better architects. — ROBERT W. GIBSON.

ARCHITECT, THE, IN FRANCE. There are in France about 5000 persons assuming the title Architect; of whom there are 3000 in Paris and its *banlieue*, and 2000 in the departments. Of this number 1300 at the outside may claim to have been taught at the *Ecole des Beaux Arts*. The instruction given in that establishment is the subject of a special article in this dictionary. (See School of Architecture.) It is therefore necessary in this article to examine into the teaching of the 3700 other architects in France.

Many have studied in the workshops. These are sons of workmen and of master workmen, having followed the occupation of their fathers and completed their [illegible] architect in a neighbouring city. It follows that these are not adherents of any special school. The remainder have been taught in professional schools, or in schools in Paris, of which the principal ones will be named below.

In the first line must be named *L'École Spéciale d'Architecture*. This is situated in Paris on the *Boulevard du Mont Parnasse*. It was founded about 1863 by an association in which Mr. Emile Trélat took the most active part. The charge for teaching is 800 francs per year. The course of study is nearly the same as at the *École des Beaux Arts*, but is directed in a more practical fashion. Its duration is fixed at three years. The attendance of the pupils is obligatory, and they do not enjoy the same liberty which is found at the *Ecole des Beaux Arts*, —a liberty which may be thought too complete.

After this special school comes the *Écoles Nationales des Beaux Arts* of Bourges, Dijon, Lyons, and Algiers, whose programmes of study are also more or less closely copied from those of the Paris National School. The tuition given is gratuitous. It includes figure drawing, the drawing of ornament, painting, sculpture, architecture, construction, mathematics, geometry, perspective, anatomy, general history of the arts, and also the decorative arts especially useful in the country where the school in question is established. For instance, at Bourges the application of painting and sculpture to ceramic ware; at Lyons special studies of flowers with a view to their application to the designing of textile fabrics. In one of these schools a young man may go through his architectural studies as completely as in Paris, and perhaps even more quickly.

Architecture is also taught, but in a fashion less complete, in the schools of decorative art, of which there is one in Paris, *Rue de l'École de Médicine*, and others at Aubusson, Limoges, Nice, and Roubaix. In these establishments there is found a freer spirit, a more modern and less classical feeling, than in the different *Écoles des Beaux Arts;* so that the tendency in our architecture to deviate from the Italian traditions and forms in order to become more purely French is given by the young architects who come from the above-named schools of decorative art.

In all the provincial schools scholarships, whose value is from 200 to 2000 francs, are given to the most deserving pupils, in order to permit them to complete their education by travel, or by a sojourn in the city of their choice. It is then easy to become an architect in France. In all the schools the theoretical education is perfect. The young architect who leaves such a school will know how to draw the most complicated subjects. He will be skilled in perspective, he will know how to calculate the strength of materials; but there will be lacking to him the knowledge of the materials themselves and the practical manner of using them. Therefore the designs made by these pupils may often be impossible to execute, or too costly to undertake. Then it is that such an architect feels most unpleasantly the competition of the engineers, especially the competition of the pupils of the *École Centrale des Arts et Manufactures*, an institution where architecture is taught, not as an art, but as one of the branches of industry. This institute, started by private initiative in 1829, and given up to the State in 1855, teaches mathematics and physical science regarded from the point of view of their application to industrial art, and gives much time to practical work and to handiwork. It causes its pupils to carry out numerous designs based upon real requirements; and in this course "the palace of the rich amateur," dear to the professors of the *École des Beaux Arts*, does not exist. If the scheme given out is the design of a skew bridge, for instance, the instructor is not contented with a simple study of stereotomy, but will ask from the pupil also a little model of this bridge cut in plaster, and also working drawings for the stone cutter drawn on the wall, and of the full size of execution.

This school was in the first place installed in the *Hôtel de Juigné* in the *Marais*, where it remained until 1884. In this year it was reconstructed in the same same quarter in the *Rue Montgolfier*, where it occupies 6300 square metres of land given by the city of Paris. One may be admitted to this school after the age of eighteen years, and after an examination on the French language, the elements of all the sciences, free-hand and geometrical drawing. The number of pupils admitted each year is about 250; the duration of the course is three years; the cost of the tuition is 900 francs for the first year, and 1000 francs each for the second and third years. The first year is principally given up to the study of general science; the two others to study of science applied to industry, to applied mechanics, the construction of machines, analytical chemistry, industrial chemistry, metallurgy, mining engineering, public works and railroads, architecture, naval construction. During the last two years the students are divided as constructors, mechanics, metallurgists, and chemists; at the end of the third year are examinations in each specialty, the result of which is the obtaining of diplomas. At the beginning of the month of June, when the lectures and the examinations are completed, the subject of the general *concours* is given out. Instead of being shut up in a separate room to study the scheme proposed, they quit the school for a month in order to prepare it. They visit the workshops where they may gain needed information, and from these they bring away notes and sketches. On the 1st of July they return to the school and begin their drawings. These drawings are accompanied by a specification or description, and by mathematical calculations as may be needed; it is discussed critically and controversially with its author at an oral examination.

From 110 to 150 students obtain the diploma of engineer each year. To others is given a certificate of capacity.

What becomes of all the young architects and engineers who come each year from the schools or from the workshops? He who is so happy as to obtain the great prize of Rome has his career assured. He goes abroad for four years to finish his studies at the Villa Medicis in Rome, and on his return the State gives him the best places and confides to him the most important constructions. Later he will be a member of the Institute. The best pupils of the schools, and those who have obtained diplomas, establish themselves easily. Their important clients will be the State, the city of Paris, and the Communes. In France the greater part of the property of the State is directed by the different ministries; thus, the military buildings are in charge of the Ministry of War; the prisons belong to the Ministry of the Interior; the diocesan buildings to the Ministry of Public Worship, and those which cannot be attached to any special ministry are confided to the Ministry of Fine Arts under the name of Civic Buildings (*bâtiments civils*). This ministry directs also the business of the *Monuments Historiques*, and the persons charged with the task of restoring and caring for all the interesting monuments of past centuries. These different duties offer numerous posts to architects. The civic buildings and the national palaces occupy 300 architects and accountants. There are forty positions of architects of the Historical Monuments, and these are obtained after a special examination. The Department of the Seine (in which is situated the city of Paris) employs 27 architects and as many engineers. The city of Paris employs 85 architects and accountants. The service of diocesan buildings includes 85 similar places. Moreover, each department has an architect especially entitled Architect of the Department; and each city an architect similarly designated. Those who cannot succeed in securing such an official place as those which have been mentioned content themselves with private work. Many also never in all their career build anything, but devote themselves to keeping in good condition those buildings which are intended for renting. They occupy themselves with accounts and bills, and with the carrying out of necessary repairs. There are even some who do nothing whatever but the verification of accounts, for in France the bills of workmen and mechanics undertaking small pieces of work are systematically made out, with an overcharge of from 25 per cent to 30 per cent, the numerous details of which make it impossible for the proprietor to assure himself of the overcharge, and which make it essential to appeal to a professional architectural accountant to bring the amount down to the legal price. Whatever may be the importance of their situation all have to struggle against severe competition, for in France the profession of architect is free; any one may take that title. The law requires only skill and capacity. Titles and diplomas obtained in the schools are only useful as a recommendation to the client.

That which fixes the duty of the architect and establishes his responsibility is the task he accepts from the proprietor and the contract which has passed between them, either tacitly or in writing. In the judicial sense of the word, the architect is he who is charged with preparing the plans and specifications of a building, with carrying out the work. His mission stops here. To furnish the materials and the workmen is the duty of the master mechanic (*entrepreneur*). But the duties which he has undertaken are numerous and varied. He must follow the intentions of the proprietor and build according to the best conditions of solidity and durability. He must verify the claims of the workmen, basing his decisions upon the tariff of prices commonly adopted in the neighbourhood; and this he must do while observing police regulations relative to party walls, sewers, street lines, etc. It is impracticable and unnecessary to cite all these laws and regulations. We must mention only those which have an influence on the form of buildings. Among these we find in the first place the rules concerning the projections of buildings on a public way. The projections which are authorized vary according to the width of the streets; in the streets below 7.80 m. in width the projection of the cornice must not exceed 25 cm., and in streets of more than 7.80 m. in width this projection may go as far as 50 cm. Balconies are allowed a projection of 50 cm. in the narrower streets from 7.80 m. to 9.75 m. in width; and they are allowed 80 cm. of projection in streets of 9.75 m. in width and above that. Then come the regulations as to the heights of buildings. This height is also determined by the width of the street. It is measured from the sidewalk to the cornice. That is to say, it includes all the strictly vertical part of the construction up to the beginning of the roof. It is limited to 12 m. for streets below 7.80 m. in width, to 15 m. for streets of from 7.80 m. to 9.75 m. in width, to 18 m. for streets of 9.75 m. to 20 m. in width, and finally to 20 m. for streets of more than 20 m. in width. The height of the stories is also regulated. It ought to be at least 2.80 m. for the ground story, and at least 2.60 m. for the other stories. Moreover, [illegible]

[illegible] above the ground [illegible]. The height of the wall to the springing of the roof being thus given above, it is now [illegible] the profile of the roof and [illegible] attain. If a quarter circle is drawn tangent to the line of the exterior of the wall at the top, no part of the roof may project beyond that quarter circle; the radius of this quarter circle being equal to the width of the street up to the limit of 8.50 m., which it must never exceed. This provision has an immense influence on the appearance of the houses of Paris; for the architect, desiring to lose nothing of the space which is allowed him, follows this quarter circle as closely as possible in the outlines of his roof, and, therefore, adopts a round form in place of an inward slope.

These regulations, as of the form of roofs, the height of the houses, the projections of mouldings and balconies, are the principal causes of the monotonous and uniform aspect with which we may reproach the modern constructions of Paris and other great cities of France. But if these regulations detract from the picturesque effect of our cities it must be admitted that it is well to limit the rights of proprietors in the use of their own building lots; and in this way, to allow light, air, and sun to penetrate into the streets. From one point of view, in the matter of free movement, the width of the street ought to be proportioned to the number of inhabitants which the houses fronting on that street contain; and it is logical to limit the number of stories, and consequently, the number of inhabitants, especially in houses built on the narrower streets.

Failure in observing any one of these regulations imposes upon the architect a responsibility in the exact proportion of the mischief it does to the proprietor. This responsibility is made the heavier by the fact that the architect's acceptance of a piece of work relieves the master builder from all responsibility, while the architect remains responsible during a term of ten years for all errors or failure of construction, and for all errors in the plans.

As remuneration for all these cares and responsibilities the architect has the right to certain fees, and in his quality of a privileged creditor he is to be paid before others, even before those who hold debts secured by hypothecation of the property. In the old legislation the fees of the architect were fixed according to the difficulties of the work, the talent of the artist, or in accordance with local usage, but since the beginning of the century decisions are reached generally by appeal to a legislation [illegible] *du conseil des bâtiments civils*, dated the 12th *Pluriose*, year eight of the Republic. This allows the architect for plans and designs [illegible] per cent; for superintendence, 1½ per cent; for the adjustment and claims of the settlement of the builders, 2 per cent — altogether 5 per cent of the total claims allowed.

This tariff, which is applicable to public work, cannot, however, be fixed for private work, as was settled by a decision of the *Cour de Cassation*, dated 27th March, 1875. There is, therefore, no more now, than in the last century, any law fixing the fees of the architect for private work. Custom alone, supported by the statement of terms above given, gives the architect 5 per cent upon the work done; but this rate may be increased or lowered by a special agreement between the architect and the proprietor according to the importance of the work.

In order to resist the invasion of the profession by numbers of incapable men, there are formed in France several societies of architects having for their principal common object to unite and to attach to a common centre all the architects who have the necessary guarantees of instruction, of experience, of capacity, of morality, and the further object of bringing about congresses, or conventions, in which may be discussed questions of art, construction, jurisprudence, and responsibility. At the head of all societies of architects comes the section of architecture of the Academy of Fine Arts, consisting of eight members. This is, of course, a branch of the great national body, the Institute of France. Of societies in the usual sense of the word there are in Paris, *La Société centrale des Architectes français*, founded in 1840. It includes 500 members, nearly all former pupils of the *Ecole des Beaux Arts*. This is the classical society, the guardian of the theories of art taught at the *Ecole des Beaux Arts*.

L'Union Syndicale des Architectes français; founded in 1890 by Mr. De Baudot. It consists of 300 professional members and 300 auxiliary members, these last belonging to the different industries connected with building. In this body theories advanced and taught by Viollet-le-Duc are influential.

In the provinces and Algiers are some thirty local associations (*Associations régionales.*) The chief and the oldest of these is *La Société académique d'Architecture de Lyon*, founded 1830 and consisting of thirty-eight members.

Twenty provincial societies are grouped under the general title, *Association provinciale des Architectes français*, with its centre at Lyons. This association includes now about 500 members. — ALEXANDRE SANDIER.

ARCHITECT, THE, IN ITALY. In Italy the architect is generally educated in the *Scuole d'Applicazione* for engineers, where the instruction does not distinguish between the two classes of students. This is in a double manner prejudicial to the former. Not only do the engineers consider themselves as architects — and the public share with them the confusion — but the architects lack the proper training

Men of the highest position in the profession, like Sig. Camillo Boito,[1] have in vain protested against this abuse, insisting that architects, as in France, should be trained in the Institutes of the Fine Arts. Milan, alone among Italian cities, has a Higher Technical Institute, where architects have a separate course of three years' duration, with instruction of the best order. There is also a school of *Capomaestri*, master builders, that is frequented by most of the pupils of the architectural department. There are indeed students of architecture in the Institutes of the Fine Arts who do not receive diplomas as architects, but merely as professors of architectural drawing, or design, the term "*disegno*" having either meaning. These, however, erect a great many buildings, and, when once familiarized with the details of construction, are said to be in general better architects than those furnished with the diplomas of the schools of application. Moreover the Italian versatility, which in the masters of art of the fifteenth and sixteenth centuries has been the wonder of the rest of the world, would seem not to be altogether a thing of the past, for many architects of our time, and among them some of the most distinguished, have never received a diploma. Several of them were painters, some have learned in the offices of other architects, one was a wood carver, one a mason, and several began as mere *dilettanti*. Various bills introduced by cabinet ministers, as well as other attempts to regularize and ameliorate the conditions of the profession, have failed; but still the study of architecture advances, the new work is better than that of some years ago, and, in general, the Italian cities of to-day may compare favourably in respect of improved construction with those of other countries.

With many architects a large part of their work is that of the conservation or restoration of ancient monuments. Within the last half century the principles of this branch of the art have so changed for the better that it may be worth while to give here the substance of the resolutions adopted by the Congress of Italian architects and engineers about 1884, to which the actual practice as a rule conforms.

When it becomes absolutely necessary to prevent the destruction of a monument of architecture, it should be *consolidated* rather than *repaired*, and *repaired* rather than *restored*, all pains being taken to avoid additions and renovations.

Where, however, these last are really indispensable for the purpose of solidity, or for other invincible cause, they should be done so as to be readily distinguishable from the original construction.

When, on the other hand, it is proposed to reproduce exactly the original type in things partly destroyed or never completed, or so decayed as to menace ruin, the material at least should be evidently different from the old, or should bear some mark — best of all the date of restoration — so that the attentive observer need never be deceived. In monuments of antiquity, or others where the importance is purely archæological, the additions necessary to their preservation should be plain, squared blocks, even though the continuation of mouldings or ornaments be beyond doubt.

Where the monuments derive their charm, distinction, or poetry from variety of marbles, mosaics, or paintings, from the tone acquired by age or the picturesqueness of their surroundings, or even from their dilapidation, the work of consolidation should be kept within the narrowest limits possible, and all pains should be taken not to diminish their artistic attractiveness.

The additions and modifications which have been introduced at different times into the edifice should be considered as monuments and treated as such, unless their artistic and historical importance be manifestly inferior to that of the edifice itself, and unless they should at the same time disfigure or hide noteworthy parts of it. In case of removal — where possible, and they are worth the expense — they should be preserved in whole or in part, preferably together with the monument from which they have been taken.

Before laying hands upon a building, also at different times during the progress of the restoration, and again after its completion, photographs should be taken, which should be deposited with plans, elevations, and details of the building, in the Ministry of Public Instruction, and at the office charged with the preservation of monuments, or, in the case of a church, with its records.

A commemorative stone attached to the building should give the dates and principal parts of the restoration.

Without pretending that these rules have never, in any respect, been violated in recent work, it may still be claimed that their action has been most salutary, and that they have rendered impossible such feats of vandalism as that, *e.g.*, performed by the late Sir Gilbert Scott in Salisbury Cathedral.

Both the law and the building regulations of the various cities — which have generally the force of law — hold the architect or engineer, together with the constructor or builder, responsible for defects resulting from any fault of theirs that may become evident in the building during the space of ten years after its completion.

The commission paid to architects varies from one part of Italy to another, and is determined by the usage of each part. In Lombardy it is 5 per cent on the cost of the building; in Naples it reaches as high as 9 per cent.

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[1] *Questioni pratiche di Belle Arti*, *Milano*, 1893.

For any public work of importance the government or the municipality, or even a private individual, as the case may be, invites a competition among architects, which may be local, or national, or international. In the absence of any predominant usage the conditions fixed are sometimes absurd, sometimes reasonable and liberal. For instance, on one occasion the Parliament voted to invite plans for new buildings at Montecitorio, and proposed a sum for premiums that would not have paid the cost of the necessary drawings, while, on the other hand, the city of Milan offered premiums for designs for the proposed new façade to the cathedral amounting to 80,000 lire. The architects know the advantage that would accrue both to themselves and to their employers from a settled system of competitions, and have therefore, in more than one reunion of their body, urged the general adoption of rules which — as the competitions in England and America are guided by no universal principles — it may be worth while to repeat.

1. The competition to be divided into two grades; the first to consist of projects in general (in Massima), the second of the same in detail. (This principle is disputed by many, though it is established and works well in France.)

2. To the second will be admitted with compensations those distinguished as best in the first competition, and others without compensation.

3. The programme shall be approved by the chief authority of the province or region where the competition is announced, at the instance of its principal institute of the fine arts. When works of great importance are concerned demanding the direct or indirect intervention of the government, the approval shall be required of the Minister of Instruction at the instance of the permanent Commission of the Fine Arts. (This relates only to public buildings, and cannot exactly apply either to England or to America, where the sanctions demanded would be quite other.)

4. The body inviting the competition shall nominate the president of the jury. The other members shall be nominated, one third by the competitors, one third by the inviting body, and one third either by the permanent Commission of the Fine Arts, or by the chief institute of the fine arts in the region or province where the competition takes place. (This is a general rule; the composition of the jury is often very complicated, as in the competition for the façade of the Cathedral of Milan, where the jury was composed of fifteen members representing as many different elements.)

5. No competitor can serve upon the jury.

6. The judgments of the jury shall be given openly and communicated to the public (also a point upon which all are not agreed).

7. The body (*ente*) inviting the competition should fix for the premiums a sum total greater than would be assigned to an architect as fee for the plans for the edifice.

8. The author of the plan on which is conferred the first prize should direct the execution of the work. In case he should not be able to direct the constructive part, there should be left to him the artistic direction.

In Italy the architects seek to establish these rules by law; in the Anglo-Saxon world they could probably only be fixed by custom, or enforced by the refusal of architects to compete under less favourable conditions.

I am indebted for the facts exposed in this article to Sig. Comm. Camillo Boito, Professor in the Higher Technical Institute of Milan, as well as practical architect. They are gathered in part from his book already cited, and from personal communications most courteously accorded. — JOHN SAFFORD FISKE.

ARCHITECTONIC; ARCHITECTONICAL. Pertaining to or having the character of Architectonics.

ARCHITECTONICS. The science of architecture; architecture in its scientific or technical aspects as distinguished from the purely artistic or historical aspect.

ARCHITECTURAL. *A.* Pertaining to architecture; as, an architectural publication or drawing.

B. Having the character of a work of architecture; as, an architectural composition.

C. Composed or treated in accordance with the principles of architecture; as, an architectural decoration.

ARCHITECTURE. *A.* The art and the process of building with some elaboration and with skilled labor; and, by extension, the results of such building; thus, skilled shipbuilding, whether wholly traditional, as among the islanders of the Pacific, or partly scientific, as among European peoples, is called naval architecture.

B. The modification of structure, form, and colour of houses, churches, and civic buildings, by means of which they become interesting as works of fine art. It is this sense which is commonly given to the term when used without qualification; and it is in this sense that the term is employed throughout this dictionary. The term sometimes signifies the artistic character of a given building, group of buildings, epoch, or style; thus, it is said that the buildings of such a town are of a noble or of an unattractive architecture, or that the architecture of an epoch shows strong traces of Oriental influence; in this sense often with the article.

(See Byzantine; Grecian; Gothic; Moslem; Neoclassic; Romanesque; Roman Imperial; also the geographical terms, such as Asia Minor;

England; France. For a comparison of the different styles of architecture see Style.)

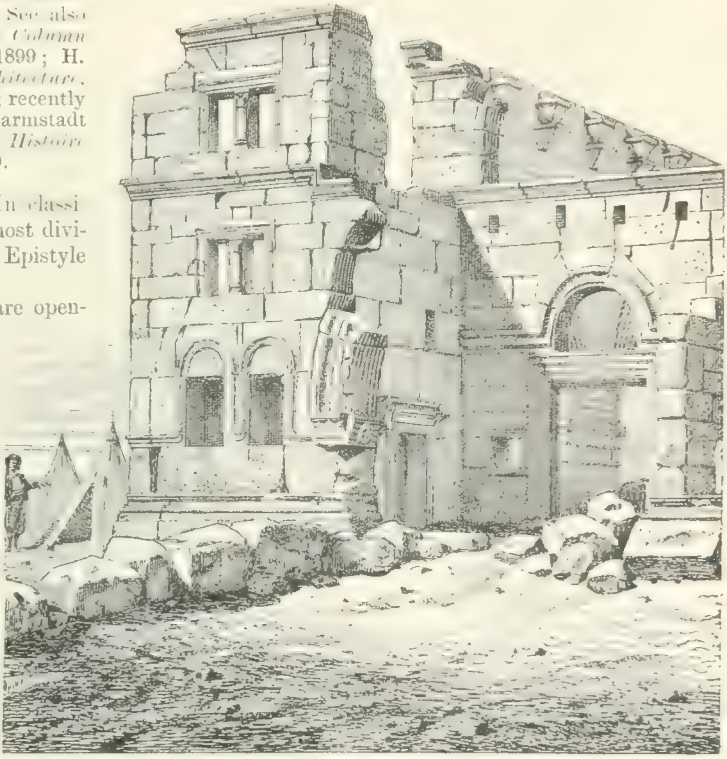
R. Sturgis (Edited by George Iles), *Bibliography of Fine Art*, Boston, The Library Bureau, 1897, Part III, in which are named about one hundred books. See also W. P. P. Longfellow, *The Column and the Arch*, New York, 1899; H. H. Statham, *Modern Architecture*, London and New York, 1898; recently published volumes of the Darmstadt *Handbuch*; Auguste Choisy, *Histoire de l'Architecture*, Paris, 1899.

ARCHITRAVE. *A.* In classical architecture, the lowermost division of an entablature, the Epistyle (which see).

B. In the case of a square opening, because this lowermost division is supposed to be carried along the upright sides as well as the top, any moulded or otherwise ornamented band carried around a square door, window, or the like, on the wall face, or projecting from it. (See Doric; Entablature; Grecian; Greco-Roman; Roman Imperial.)

Banded Architrave. (See Banded.)

Jack Architrave. In the Entablature (which see) of certain orders, the lowest fascia of the architrave.

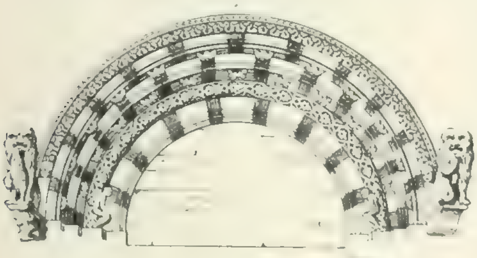


ARCHITRAVE.

A 6th-century building in Syria, with architraves enclosing the square windows, and a bent or broken architrave carried around the arch of the great doorway.

ARCHITRAVE TRIM. A trim or casing around the sides and top of an opening, and having more or less the form of an architrave.

ARCHIVOLT. An architrave modified by being carried around a curved opening instead of a rectangular one. (See Arch; Arch Band. For the adornment of the archivolt by mouldings, see Romanesque Architecture and the account of Mediæval Architecture under all geographical terms. For ornamentation by means of colour, see especially what relates to Italian Architecture under Gothic Architecture. Also Moslem Architecture and the geographical terms.) (Cuts, cols. 147; 150.)



ARCHIVOLT OF 12TH CENTURY: S. GIOVANNI, LUCCA.

Adorned with continuous carved and plain mouldings and voussoirs carved and of contrasted colours.

Interlacing Archivolt. (See under Interlace.)

Returned Archivolt. One in which the band formed by the archivolt is returned at an angle nearly or exactly ninety degrees and carried horizontally.

ARCH OF CHOSROES. A cavernlike recess in the rock shaped into the form of a great arch of curiously elaborate curve. It was so adorned by Chosroes, King of Persia, about the close of the sixth century A.D.

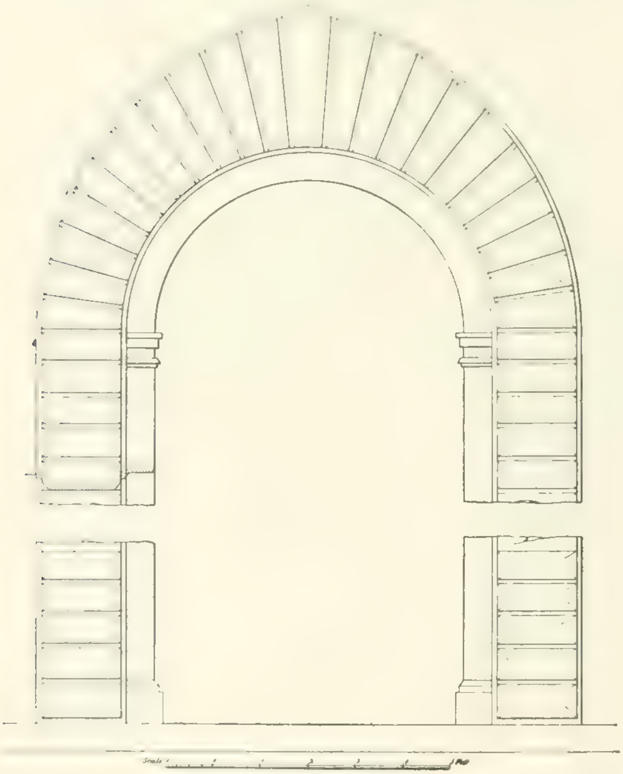
ARCH OF CONSTANTINE. In Rome, near the Coliseum; built by Constantine the Great († 337) and partly adorned by sculptures taken from earlier monuments. (See Memorial Arch.)

ARCH OF CTESIPHON. The entrance portal of the palace of the Sassanian kings of Persia at the town named, having a span of about 75 feet and a curious elliptical curved intrados, which has not been absolutely determined by measurement. The building is largely renewed, but the arch remains in almost perfect condition, and it is curious on account of the structure, built in the Byzantine manner, of flat bricks or tiles laid in mortar, and probably completed without the use of centring.

ARCH OF GALLIENUS. In Rome, near the ancient Esquiline Gate. It is a simple structure with a single archway, Corinthian columns, and pilasters.

ARCH OF SEPTIMIUS SEVERUS. In Rome, at the northwest end of the Forum. (See Memorial Arch.)

ARCH OF TITUS. In Rome, at the southeast extremity of the Forum. It was erected by the Senate in the reign of Domitian, Titus's brother and successor. It commemorated the military exploits of Titus in the East, and especially the conquest of Jerusalem. The well-known sculptures of the triumphal procession, with the seven-branched candlestick carried by soldiers, are inserted in the side walls or jambs of the archway. The arch, as now standing, is mainly modern work of travertine; only the archway with the columns and pedestals nearest to it being of the original structure in Pentelic marble.



Archivolt, Palazzo Niccolini, Florence; 15th Century.

Each voussoir cut with rustication.

ARCH SOLID. One of the masses or pieces of material which, generally more or less wedge-shaped, mutually prevent one another from falling; a Voussoir (which see).

ARCHWAY. A passage through or under an arch, especially when long, as under a barrel vault. It is not a rigidly technical term, and is loosely used of almost any passageway having arches at either end, whether vaulted or not.

ARC LAMP, ELECTRIC. (See Electrical Appliances.)

ARCOSOLIUM. An arched recess or sepulchral cell in a Roman subterranean burial place or catacomb; especially one designed to receive a sarcophagus.

ARCUATE; ARCUATED. Provided with or characterized by arches or archlike curves. It is common to distinguish between trabeated and arcuated building. Thus an Egyptian hypostyle hall or a Greek Doric temple are wholly trabeated; but the Roman thermæ of the Empire, the palace halls on the Palatine, and such late buildings as the Basilica of Maxentius (which see) are wholly arcuate. The Byzantine builders of the East and Romanesque builders of Western Europe were eager to use arcuate building; the openings for doors and windows were arched, and the large and small interiors were all vaulted whenever and wherever there were skill and means sufficient. Out of this tendency grew the whole system of Gothic building, which is arcuate in the highest sense. — R. S.

ARCUATION. *A.* The employment of arches.

B. A series or system of arches. (*Arch. Pub. Soc. Dict.*)

ARCUS CHORALIS; ARCUS ECCLESIÆ; ARCUS PRESBYTERII; ARCUS TRIUMPHALIS. (See Triumphal Arch, *B.*)

ARDISH. In India, a kind of interior decoration made by embedding pieces of glass in the walls and ceiling and covering them with plaster, which is subsequently cut away to form ornamental tracery. — (C. D.)

AREA. *A.* A sunken trench or court reserved between a building and the surrounding ground; either for dryness or to keep the soil from pressing against the foundation walls, or to allow of access to doors, or light to windows which are below the surrounding level. Specifically, such a space, generally at the front of a city house, commonly used to give access by steps to the basement story or cellar; hence, —

B. Any open space, whether sunk or not, more or less enclosed and forming a small court at the entrance to a basement. A front yard when of limited extent.

Blind Area. An area covered and concealed and intended merely to keep the foundation walls dry and free from the soil. In British usage, differing from an Area Drain (which see) in having solid cross walls, and being commonly covered.

Dry Area. In British usage, a narrow air space, smaller than an area in the usual sense, to keep the dampness of the soil from foundation walls. Usually consisting of a series of communicating chambers formed by a light outer retaining wall braced against the main walls by cross buttresses.

AREA DRAIN. *A.* In British usage, a narrow area (see Area, *A*) to keep the dampness of the soil away from the foundation walls. Properly, it is uncovered and uninterrupted in its length, the cross walls, if used, having large openings at the bottom.

B. (See Drain.)

AREA WALL. The wall surrounding, or partly surrounding, an area; specifically, the retaining wall of an area. (See Area, *A.*)

ARENA. In an amphitheatre, the flat, open space enclosed by the seats for spectators and reserved for the gladiatorial combats or other spectacles; so called because spread with sand. (See Amphitheatre.) Hence, any level space wholly or partly surrounded by seats for athletic contests, combats, or sports.

ARÈNES, LES. A Roman amphitheatre in Nimes (Gard) in southern France. It is large for a provincial Roman monument, nearly 450 feet long and 335 feet wide. It is one of the best preserved of existing monuments of this kind. (Compare Amphitheatre; Roman Imperial Architecture.)

AREOSTYLE. Same as Aræostyle (which see).

AREOSYSTYLE. Same as Aræosystyle (which see).

ARETINO, NICOLÒ. (See Lamberti, Nicolò di Piero.)

ARGELIOS; architect.

A writer on architecture mentioned by Vitruvius. (See Vitruvius.) He quotes him on the Doric order, on the Corinthian order, and on an Ionic temple of Æsculapius at Tralles, of which he seems to have been the architect (Vitruvius, VII., præf. 12). He flourished probably about 376 B.C.

Vitruvius, ed. Marini.

ARISTOTELE DA BOLOGNA. (See Fieravanti, Ridolfo.)

ARISTOTELE DA SAN GALLO. (See San Gallo, Bastiano.)

ARLER, PIERRE. (See Parler, Peter; Mathias D'Arras.)

ARMATURE. *A.* In French, a stiffening piece, especially a brace or strap of iron used to strengthen a construction of some other material. The most common application of the term is to the iron crossbars to stiffen and support the glass of a leaded or stained glass window; and hence to the entire framework.

B. In French, the light construction in tiles laid in strong cement used in Roman Imperial Architecture as a secondary and more permanent centring. The term includes also the stouter ribs of angles and the like which were built at the same time and upon which the mass of rubble laid in mortar (see Blocage) was laid.

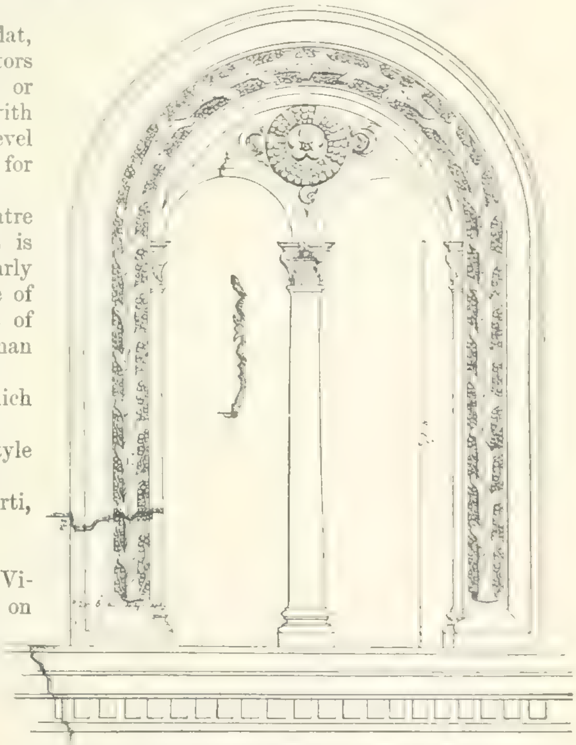
C. (In electricity, see Dynamo Electric Machine, and other subtitles under Electrical Appliances.)

ARMORIAL. Having to do with heraldic bearings, coats of arms, and the like.

ARMORIAL ACHIEVEMENT; BEARING. (See Arms.)

ARMOURY. *A.* A room or building serving as a depository for arms and armour.

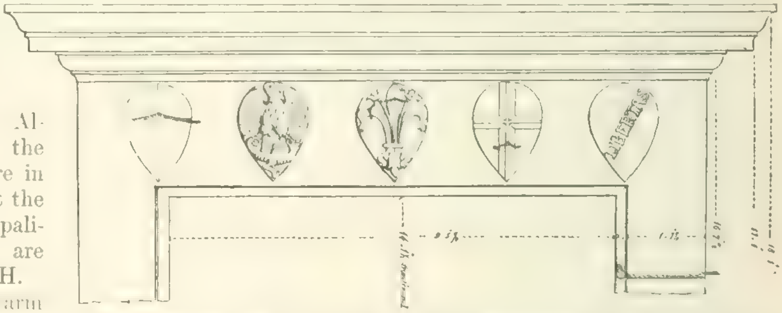
B. A building or establishment for the manufacture of arms; especially one maintained by the government. (See Arsenal, *B.*)



Archivolt, Palazzo Pazzi-Quaratesi, Florence. 15th Century.

C. A building for the use of a body of militia, with storage for their arms and equipments. In modern American practice, the newer armouries are strongly built structures of considerable size, containing a large and well-lighted drill hall, in some cases large enough for battalion exercises and practice with light artillery; a shooting gallery, a gymnasium, special rooms for the higher officers, and in many cases separate rooms for each of the companies of a regiment. Libraries, messrooms, kitchens and storerooms, workshops, locker rooms, and other accessories are features of many of these buildings in large cities, where they serve the purposes of a military club as well as of a military storehouse and drill shed. They are customarily so designed as to be capable of withstanding any mob that might undertake to seize the arms stored within. Although intended for the state troops, they are in many cases erected at the expense of the municipalities in which they are located. — A. D. F. H.

Arms painted in the Minster, Aachen (Aix la Chapelle).



Arms of the City (the Giglio) and Others carved on a Lintel: Florence, Italy.

ARM REST. The arm of a chair, stall, pew, or the like; specifically, such an arm or division between seats or stalls designed to afford considerable support for the arm or elbow, either when sitting or standing; as in a choir stall. (See Stall.)

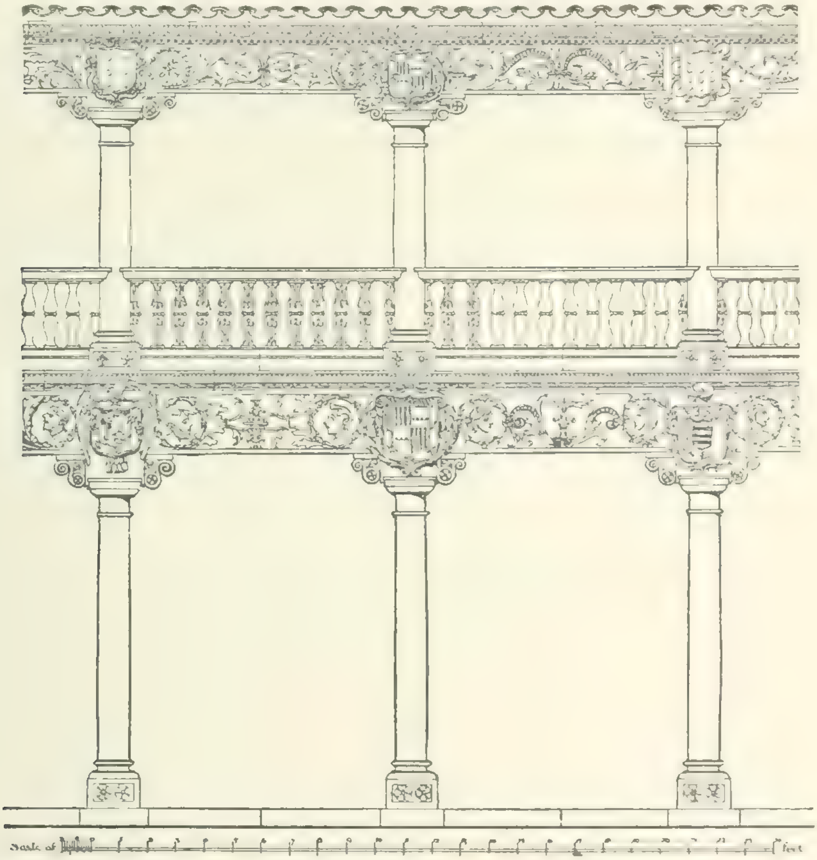
Arms, Royal, of Sweden, Vasa Family, 1562. Castle of Kalmar.

ARMS. Armorial bearings in the general sense. The arms borne by any person consist primarily of the escutcheon with its bearings, and, secondarily, of the crest, if any, the motto, or mottoes, if any, and the supporters, if any. The charged escutcheon is all that is really essential, as the bearings granted by the sovereign or by a general on the field of battle are all included in this. Even if a sovereign grants an addition to the coat of arms as previously borne by any person, this addition is made to the escutcheon and not to any other part of the achievement. The crest and the motto are assumed at will; although when once assumed they are naturally considered as ancestral. Supporters are rare; in England they are never used but by persons of the highest rank, and generally are the appendage of very high rank, if not of royalty.

The escutcheon borne during the Middle Ages by a man was almost always a shield, the escutcheon borne by a woman was always a lozenge. In later years, when heraldic bearings were still used for splendour and distinction, but were no longer used in any part of the war dress, the escutcheon for men assumed other shapes, especially that of the oval which was very common in the eighteenth century, but the lozenge was always retained by women. Women, of course, bore no crests. Thus, if an estate fell to an heiress, the ancestral crest, if any, would remain unused, while the escutcheon was still used by her. Mottoes are indifferent, being assumed at pleasure, multiplied at pleasure, and used or not used according to the whim of the designer or the person employing him. Mottoes were very commonly a part of the Device (which see) rather than a part of the arms proper.

The essence of heraldic display being in the use of colour, with gold and silver, it was natural to employ such decorations largely in stained glass and also to apply them to tombs, either by painting directly upon the stone, or by the richer and more permanent process of applying enamel to a metal plate. A few enamelled escutcheons of great beauty have been preserved, and a few instances are known of painted escutcheons, but by far the greater number have lost their colouring. In order to guard partly against this decay of the colour, which was easy to foresee, a custom grew up of carving the armorial bearings in slight relief, and mediæval tombs are very numerous in which such sculptured shields still remain. It was assumed that every bearing was in its essence a thing laid upon a field, so that a pale or a fess was imagined to be a kind of ribbon having a certain definite, though slight, thickness, and, therefore, to be denoted in sculpture by such slight relief and to be represented in uncoloured drawing by a thicker line at the bottom or right-hand edge, which thicker line would suggest a shadow. Thus, if an escutcheon bore a pale, and this pale was charged with three disks, the escutcheon would be carved with the pale raised a half inch or more above the field, and the disks (called bezants) raised as much more above the surface of the pale. These carved escutcheons were, of course, painted when originally put up; but the painting having disappeared, their forms are perfectly legible to-day by means of their shape and their relief. — R. S.

Charles Boutell, *Heraldry, Historical and Popular*, London, 1864 (unfortunately scarce, the book which best gives the spirit and purpose of heraldic bearings); R. C. Jenkins, *Heraldry, English and Foreign*, London, 1886; Baron von Sacken, *Katechismus der Heraldik*, Leipzig, 1885 (two very small handbooks of great utility); H. Gourdon de Genouillac, *L'Art Héraldique*, Paris; Jouffroy d'Eschavannes, *Traité complet de la Science du Blason*, Paris; J. R. Planché, *The Pursuivant of Arms*, London; Hugh Clark, *An Introduction to Heraldry*, London, 1884; Charles Boutell, *English Heraldry*, London, 1871; John E. Cussans, *Handbook of Heraldry*, London, 1882; Woodward and Burnett, *Heraldry, British and Foreign*, 2 vols., Edinburgh and London, 1892. The best large book for general students is Berry's *Encyclopædia of Heraldry*, now out of print.



ARMS: HERALDIC BEARINGS ADORNING THE PATIO OF THE CASA POLENTINA, AVILA, SPAIN.

ARNOLD; architect.

Arnold succeeded Gerard von Rile (see Gerard von Rile) as the third architect of the Cathedral of Cologne. He was employed on that building from 1295 to 1301, and was succeeded by his son Johann.

Boisserée, *Geschichte des Doms von Köln*; Mertens-Lelob, [illegible] des *Kölner Domes*.

ARNOLD, CHRISTIAN FRIEDRICH; architect; b. Feb. 12, 1823; d. June 13, 1890.

Arnold was a pupil of Semper. (See Semper.) He won a first prize in architecture with a pension which enabled him to spend several years in Italy, France, and Belgium. On his return he was appointed professor at the academy in Dresden. He built the Villa Lonchay on the Elbe (1858–1860) and the Sophienkirche in Dresden. Arnold published *Der Herzogliche Palast von Urbino* (1 vol., fol., Leipzig, 1856).

Meyer, *Konversations-Lexikon*; Seubert, *Künstler-Lexicon*.

ARNOLFO DI CAMBIO (Di Lapo Vasari); architect and sculptor; b. about 1232; d. about 1303.

Arnolfo was not the son of Lapo, as supposed by Vasari. In a document of 1266 they are mentioned as associates in the atelier of Niccolò da Pisa (see Niccolò da Pisa) at Siena (Milanesi; *Documenti*, Vol. I., p. 146). In the "provvisione" of 1300 (Florentine cathedral) he is mentioned as "Magister Arnolfus de Colle, filius olim Cambii, *Capud* Magister laborarii et operis" (Gaye, op. cit., Vol. I., p. 445). In 1295 he began the Church of S. Croce (Florence). Vasari credits him with the marble facing of the Baptistery (Florence). Villani notes in his *Cronica* that in 1294 the citizens of Florence decided to rebuild the Cathedral Church of S. Reparata built in 407. The work was begun by Arnolfo in 1296 at the western end. His name appears in an inscription on the wall opposite the campanile, "ISTVD AB ARNOLFO TEMPLVM FVIT EDIFICATVM." He probably had charge of the building for six or seven years and built a part of the outer wall of the nave. His plan was much changed and enlarged by later architects (see Talenti, Fr.). The name Santa Reparata was afterward changed to the present Santa Maria del Fiore. The construction of the Palazzo Vecchio (Florence) is attributed to Arnolfo by Vasari without corroboration (Frey, op. cit., p. 9). The fine monument of the Cardinal de la Braye in the Church of S. Domenico at Orvieto with its mosaics and sculpture is by Arnolfo.

Vasari, Milanesi, ed.; Guasti, *Santa Maria del Fiore*; Perkins, *Tuscan Sculptors*; Yriarte, *Florence*; Gaye, *Carteggio*; Moise, *Santa Croce and Palazzo Vecchio*; Villani, *Cronica*; Milanesi, *Documenti*; Reymond, *Sculpture Florentine*; Frey, *Loggia dei Lanzi*.

ARNOULD DE BINCHE.

Arnould de Binche commenced in 1235 and finished in 1239 the Church of Notre Dame de Pamele at Audenarde (Belgium).

Gonse: *L'Art gothique*.

ARRAS. Tapestry made in Arras, Belgium; hence, owing to the immense reputation of that town as a centre of the fabrication, any tapestry of the kind used for covering walls. Late in the fifteenth century this industry was largely removed to Brussels and other cities of Flanders and Brabant; but the name remained, as in the common Italian term, *Arazzi*, and as in Shakespeare's plays, frequently.

ARRICCIO. The coat of plastering, either the first or second coat in Italian practice, ancient and modern, as preparation for painting in fresco, but not the finishing coat or intonaco. Modern practice seems to be about five parts of sand to one of lime, and the coat of plastering, when applied directly to the brick, about half an inch thick. (See Fresco; Intonaco.)

ARRIS. A sharp edge made by two surfaces meeting so as to form a solid angle; especially the edge or angle of a dressed stone formed by its face with the planes of its beds or joints.

ARRIS FILLET. A thin strip of wood of triangular section used to raise the edges of a course of slates, tiles, or the like, at the intersection of the roof with a structure rising above its level, as a wall, dormer window, or skylight.

ARRIS GUTTER. (See under Gutter.)

ARROWHEAD. The pointed tongue or dart between the ova in an egg and dart moulding or ornament; especially in Roman architecture, in which it was commonly carved with barbs. (See Egg and Dart.)

ARSENAL. *A.* A place, usually a large building, arranged for the storage of weapons and implements of war. (See Armoury, *A.*)

B. A place where weapons are manufactured; especially such an establishment supported by a government for the exclusive use of its own armed force.

C. Anciently, a government dockyard and navy yard. The most celebrated institution of this kind was at Venice, which was already famous in the twelfth century, and where the buildings and the surrounding wall remain generally intact.

ARTAUD (Artaudus), **GUILLAUME**; architect and engineer.

With the title "operarius" he began the construction of the great bridge called the *Pont Saint Esprit* over the river Rhône (France) in 1265. Associated with him were Clarius Tharanus, Jacobus Bengarius, and Pons de Gainaco. This great bridge, begun in 1265 and completed in 1309, is 5.40 metres wide and 840 metres long, and has 26 arches.

Bauchal, *Dictionnaire*; De Girardot, *Des Ponts au XIIIe Siècle*.

ARTEMISEION. A building or shrine of Artemis. (See Temple of Artemis (Diana) at Ephesus.)

ARTIST. *A.* A maker of a work of art.

B. One devoted to the reproduction of works of art and to the study of any art with a view to producing such works. In modern usage, this term is almost wholly limited to the producer of works of fine art.

A curious abuse has crept into the parlance of artist painters, who, seeing around them in the United States but few artists who are not painters, knowing but few sculptors, and still fewer architects who are artist-like in their methods of work, while no engravers, die-sinkers, or other workmen in the higher ornamental arts, have succeeded in attaining full recognition, have come to limit the term to artists of their own kind. Even in a meeting of artists, a painter will sometimes speak of the sculptors, the architects, and the "artists," as intending to act together in a certain matter. This is one of the rather numerous errors of speech which accurate speakers will avoid.

— R. S.

ARTORIUS PRIMUS; architect.

The inscription found upon the greater theatre at Pompeii, M. Artorivs, M. L. Primvs Architectvs, undoubtedly refers to the architect who restored the theatre after the earthquake of 63 A.D. His name is found also on the basilica at Pompeii, which he probably restored at the same time.

Overbeck, *Pompeii*.

ARUNDEL, THOMAS; archbishop and Lord High Chancellor; b. 1353, d. Feb. 19, 1413.

This famous ecclesiastic and statesman was the third son of Richard Fitzalan, Earl of Arundel. He was made archdeacon of Taunton in 1373, and Aug. 13 of the same year was promoted to the bishopric of Ely (Cambridgeshire, England). He was created archbishop of York April 3, 1388, and archbishop of Canterbury Sept. 25, 1396. He was several times chancellor of the kingdom. While archbishop of York he built, or caused to be built, the episcopal palaces of Holborn and York. At Canterbury he gave a chime of five bells called "Arundell ryng," and a thousand marks for the construction of the nave of the cathedral. He built a spire on the northwest tower of the cathedral.

Bentham, *Cathedral Church of Ely*; *Arch. Pub. Soc. Dictionary*; Willis, *Canterbury Cathedral*.

ASAM, ÆGID (Egid); sculptor and architect; d. after 1746.

Ægid Asam was associated with his brother Cosmas Damian Asam (see Asam, C. D.) in his work. He appears to have confined himself to sculpture and stucco work, and was a sculptor of rare delicacy of feeling. The façade of a house adjacent to the Johanneskirche in the Sendlinger Strasse, Munich, is covered with remarkable sculptured decoration by him.

ASAM, COSMAS DAMIAN; painter and architect; b. Sept. 18, 1686; d. 1742 ?

The brothers, Cosmas Damian Asam and Ægid Quirin Asam, were sons of the painter Hans Georg Asam, who decorated the Church of Benediktbeuren, Germany, in 1693. They were trained in Rome at the time when the reputation of Andrea Pozzo (see Pozzo, A.) was at its height, and were cotemporaries of the elder Tiepolo (see Tiepolo, G. B.) Cosmas decorated (about 1724), the stairway and chapel of the Palace of Schleissheim near Munich. He does not appear to have been much employed at the Residenz in Munich, which was then in process of construction under François Cuvilliés (see Cuvilliés, Fr.). The most important work of the brothers Asam is the Johanneskirche in Munich (1733–1746), which is undoubtedly the finest specimen of the baroque style in Germany.

Gurlitt, *Geschichte des Barockstiles in Deutschland*; Aufleger-Trautmann, *Münchener Architektur des XVIII Jahrhunderts*.

ASAM, HANS GEORG. (See Asam, Cosmas Damian.)

ASAROTUM. In ancient architecture, a species of painted pavement used by the Romans before the invention of mosaic work.

ASBESTIC. Consisting of or containing asbestos; perhaps, as a trade name, having the fireproof qualities of asbestos without necessarily the presence of that material. In 1895 and later this term was applied to various devices for protection against fire.

ASBESTOS. A mineral of so fibrous a nature that it can be woven into a textile fabric, which is naturally incombustible; having also the quality of slow conduction of heat. Its chief use in building has been for the covering of steam pipes, etc.; and a deafening for floors has been made from the fibre.

ASCENDANT. One of the two vertical members forming the sides of a Chambranle (which see) or framelike decoration of a window or door. (Compare Traverse, *B.*)

ASHLAR; ASHLER. *A.* Squared and finished building stone; in recent times, especially, such stone when used for the face of a wall whose substance is made of inferior material. The term has usually a general signification, and a single piece would be called a block of ashlar; rarely, an ashlar. An attempt has been made to limit the term to stone which is set on its edge, that is to say, not on the quarry bed, and in this way to serve as a translation of the French adjectival phrase *en délit*; but there seems to be no authority for this limitation. (See Masonry.)

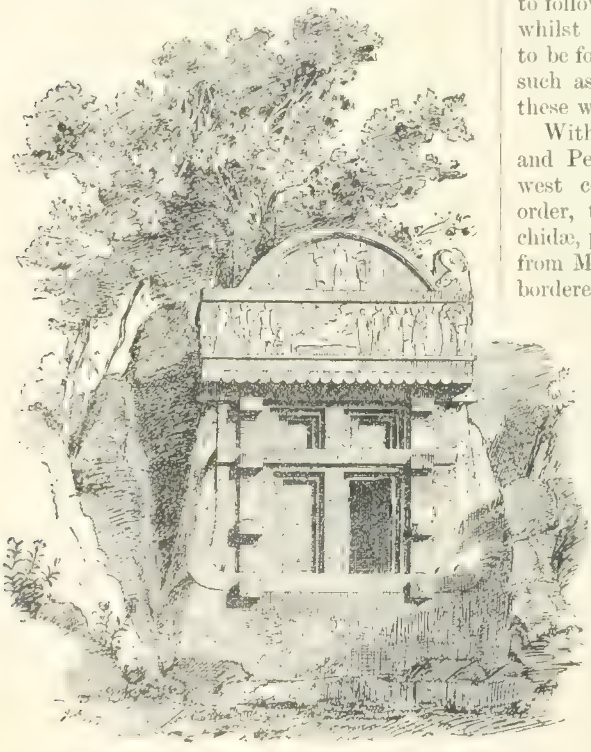
B. Attributively, and in combination, having the appearance of, or to be used in the place of, ashlar, as a veneer.

C. A vertical stud between the sloping roof and flooring in a garret or roof story, by a series of which vertical walls are provided for the sides of rooms, and the angular space near the eaves partitioned off either as waste space or as low closets. Such studding is more commonly spoken of collectively as ashlaring.

Bastard Ashlar. Stone in thin blocks or slabs which is used to face walls of brick or rubble, and so treated as to resemble solid blocks of stone. This material is often set edgeways, or with natural bed nearly vertical. (See Ashlar, above.)

Broken Ashlar. That in which the stones are of different sizes and shapes, though always rectangular on the face.

Coursed Ashlar. That in which the stones are arranged according to height, so as to form regular courses in the face of the wall.



Asia Minor: Stone-carved Tomb from Hoiran

Random Coursed Ashlar. That formed by squared stones of various and irregular sizes, but laid so as to form high courses, each of which is laid as a band of broken ashlar.

Random Range Ashlar. Same as Broken Ashlar.

Rough Ashlar. Rough stone, little or not at all dressed after quarrying.

ASIA MINOR, ARCHITECTURE OF. Although Asia Minor, from its position between the East and West, must have been peopled from the earliest times, and through it must have ebbed and flowed the art civilization from one to the other, but little remains are found earlier than the fifth century B.C. With no great river running through it as a navigable highway, and but few approaches to the centre, the defects in its physical geography would seem to have been fatal to permanence of settlement. With the exception of Magnesia and Aizaini, all the architectural developments are found on the seaboard, and the same facilities of approach which led there to the formation of colonies equally served for the destruction of such architectural monuments as, in their short tenure, the colonists were able to produce. The researches, however, of the Dilettanti Society, and of various travellers during the last century or so, have revealed the existence of a large series of monuments which fill up gaps in the history of Greek art, and enable us to follow its development with greater clearness, whilst in the one section relating to tombs is to be found a most complete series of examples, such as are not to be met with elsewhere; to these we shall refer in detail later on.

With the exception of the examples at Assos and Pergamon, all the Greek temples on the west coast of Asia Minor are of the Ionic order, the largest being that of Apollo Branchidæ, placed on an eminence about eight miles from Miletus, and approached by a sacred way bordered on either side by seated figures of archaic type, now in the British Museum. The temple itself was decastyle, dipteral, with 120 columns nearly 65 feet high; and dates from about 356 B.C. It was built on the site of two earlier temples, burnt or destroyed respectively by Darius and Xerxes. In the interior of the cella are semidetached columns with fairly developed Corinthian capitals. Notwithstanding the greater size of the temple, its fame was entirely eclipsed by that of the Temple of Artemis (Diana) at Ephesus, one of the seven wonders of the ancient world, which would seem to have derived its reputation from the rich sculpture with which it was adorned. Although the position occupied by this sculpture had already been suggested by representations of the west front of the temple on coins, its nature and extent were unknown till the discovery by Mr. J. C. Wood in 1867 of the actual site of the temple, and the recovery of three of the sculptured drums (*columnæ cœlatæ*) referred to by Pliny. The pavement around the temple had been buried to a depth of 22 feet by the silt from the river, and this had preserved the little that remained of this famous structure. Mr. Wood discovered the pavements of three successive temples at levels of 2 feet, 6 feet, and 9 feet 6 inches above the pavement of the portico. The first temple was that built in 550 B.C. by Crœsus, and one of the drums of this temple, inscribed with his name and sculptured with archaic figures, and portions of one of the capitals were recovered and brought over by Mr. Wood. Burnt 400 B.C., a second temple on a higher level was built by Pæonius, the architect of the temple of Apollo Branchidæ at Miletus. This temple suffered a similar fate some 40 years later, and in 356 B.C. the great temple described by Pliny was erected. It was octastyle, dipteral, and had 100 columns, 36 of which had sculptures round the lower drum. Portions of three of these drums were found, as also of the sculpture on five dies or pedestals on which some of the sculptured columns rested. The latest and most complete restoration is that put forward by Dr. Murray in 1896, and published in the *R. I. B. A. Journal*, Vol. III., 3d series, to which we refer our readers.

Nearly all the important temples in Asia Minor were enclosed within a peribolus wall, but without the porticus we find in Syria at Palmyra, Gerasa, and Damascus; on the other hand a porticus of two rows of columns, with entrance propylæ, sometimes formed a second enclosure to the temple; examples of this are found at Aizani, Ephesus, and Priene. At Aizani the temple, porticus, propylæ, and the whole enclosure are raised on a platform measuring 465 feet by 488 feet, and approached by a wide flight of steps on the east side. Of large temples next to the two above described there are four octastyle, pseudodipteral examples in the temples of Zeus at Aizani, Artemis at Magnesia, Aphrodite at Aphrodisias, and of Apollo Smintheus. Of hexastyle peripteral the best known examples are the Temple of Athena Polias at Priene and the Temple of Bacchus at Teos, both explored and measured by the Dilettanti Society in 1869. All the temples above quoted are of the Ionic order and of the first Greek work. Of the Doric order only two are known; the Temple of Athena at Assos, hexastyle and peripteral, with figures sculptured on the epistyle, is minutely described in Mr. T. Thacher Clarke's report on the investigations at Assos in 1881 to the Archæological Institute of America; the second example is a temple at Pergamon to which we refer later on. During the Roman occupation, many Corinthian temples were built, of which the largest, erected by Hadrian at Cyzicus, was hexastyle peripteral, with columns 70 feet high, and measured 312 feet by 112 feet; it was overthrown by an earthquake in the eleventh century and has since then served as a quarry. The only Corinthian temple of importance of which remains exist is that at Euromus (Labranda in Fellows's *Asia Minor*, and Jackly in the *Antiquities of Ionia*) near Yakli.

Asia Minor: Peasant's Hut at Gyoben.

The researches of the German government (1879–1886) under Dr. Karl Humann, have revealed at Pergamon the remains of the famous city built by Eumenes II. (191–159 B.C.) and his brother Attalus (159–130) and bequeathed by the latter to the Romans, who subsequently largely added to it. The more remarkable ruins are those found on the hill overlooking the valley of the river Seleucus, on the borders of which the Romans built an amphitheatre, a theatre, and, among other structures, thermæ, part of which were erected on a series of vaults thrown across the river; portions of the thermæ, subsequently turned into a basilican church, still exist, as also the vault over the river. The upper town, or acropolis, was built on a series of terraces, on the lower one of which, above the agora, was built the great altar of Zeus, from which the superb series of sculptures representing the battles of the gods and the Titans were removed and taken to Berlin. The great altar was raised on a stereobate, or platform, 98 feet by 90 feet, nearly 20 feet high, round which, at a height of about 8 feet from the level of the terrace, ran the great frieze, 7 feet 6 inches high, of figures in high relief. A wide flight of steps led up to the altar, which, it is supposed, was enclosed within a court surrounded by an Ionic peristyle facing outward. On a terrace beyond this, and at a higher level, stood the Temple of Athena Polias of the Doric order. Beyond this, on an immense terrace facing west, was the most important of the Roman buildings, the Temple of Trajan, or the Augusteum, of the Corinthian order. At the foot of the terrace of the Temple of Athena Polias, and cut out in the side of the hill, was a great theatre with about 90 tiers of seats. The stage of the theatre partially encroached on the great terrace, 750 feet long, raised on two stories of substructures facing the valley. At the farther, or east end of this terrace was a small Ionic temple of refined Greek work, though possibly executed under Roman rule. The splendid site of this acropolis, with its succession of terraces at different levels, crowned with the great altar, and the temples with their porticoes around them, must have formed one of the most beautiful groups of antiquity.

The theatres in Asia Minor all date from the Roman period, but in some cases they are in better preservation than in any other country, except perhaps the theatre at Orange in France.

Thus at Aspendus and Perga still exist the galleries which run round the upper part of the theatre. The walls of the proscenium, with the three or five doorways leading on to the stage, are still found in a large number of the theatres in sufficient preservation to allow of their complete restoration on paper, though, since the first record of them by Sir Charles Fellows sixty years ago, most of the material has been taken away.

The more perfect examples are those at Hierapolis, Myra (with composite capitals in the proscenium), Patara, Ægae, Alinda, Ephesus (493 feet in diameter), Laodicea ad Lycum, Magnesia, Telmessus, Termessus, Pinara, Iassos, and Tralles.

The Greek market house is represented by two well-preserved examples at Alinda in Caria and Ægae in Æolia. The former is the larger of the two, measuring 320 feet long and 34 feet deep, with three stories, the lower one divided up into a series of stone chambers, the middle story being a long hall divided down the centre by square piers and semidetached Doric shafts each side, and the upper story an open porticus with three rows of columns.

ASIA MINOR: MODERN LYCIAN GRANARY.

Colonnaded streets are found in many of the towns of Asia Minor, some of them of earlier date than those found in Syria. Remains exist at Perga (with cross streets) and Side in the south of Asia Minor, and other examples are found at Hierapolis and Laodicea ad Lycum, the most perfect colonnades being found at Pompeiopolis near Mersina, where more than a hundred columns of the street leading from the port to one of the entrance gates of the town still stand erect.

Of the gymnasia in Asia Minor the remains are insufficient to judge of their architectural treatment. The plans of three are given in Falkener's *Ephesus*, which show considerable resemblance to the thermæ of Rome, except that the baths occupy a position of secondary importance. Other examples exist at Alexandria, Troas (ascribed to Hadrian), Iassos, Sardis, and Assos.

This brings us to the last subdivision of pagan work, viz. the tombs, which constitute the most important series of Greek works of art. The earliest would seem to be the Phrygian tombs, dating from the ninth to the fifth century B.C. The Lion Tomb of Azazin, cut in the rock, has two lions rampant with a rude representation of a column between, which recalls the Lion Gate at Mycenæ, though of inferior workmanship. Numerous other examples are carved in representation of a tent with the elaborate patterns of an embroidered tent cloth carved on the front, the tomb of Midas near Doghanlu being the most important example and of considerable size, the width and height of the tomb being 51 and 61 feet respectively; others at Delikli-tach and Azazin, figured in Perrot and Chipiez's work (*Histoire de l'art dans l'antiquité*, Vol. V.), reproduce the same type of design. In Lycia the earliest example is that known as the Harpy Tomb, consisting of an immense monolith crowned by a cella enclosed with slabs of marble, on which are representations of winged figures bearing children or souls to the shades of the lower world. Of the rock-cut tombs in Lycia made known to us by Sir Charles Fellows, the earliest of them are not considered to be older than the fifth century B.C., and they indicate a wooden origin so closely, that, as pointed out by Fergusson, it would be futile to look for any earlier examples in the country. There are two types: first, those which, cut in the rock, are isolated on all four sides; and second, those which form frontispieces only on the side of the cliff. Of the former the two examples in the British Museum would seem to be copies in stone of a portable ark or shrine, placed on a substructure sometimes carved with relief sculpture. They have high, pointed, curved roofs, in the ends of which the purlins carrying the carved timber beams are clearly shown, and the whole design underneath consists of copies of timber framed with projecting beams such as to make it in its original model a portable feature.

The second class is of two types, the earliest again copied from framed structures in wood with projecting roofs carried on circular logs of timber and sometimes with a pent roof; the later ones are imitations of the porticoes of temples, but with the ends of squared timbers projecting beyond the epistyle, which, like similar features in the Persepolitan tombs, show the wooden origin of the Greek dentil here found in an undeveloped condition. At Myra, Telmessus, Antiphellus, Patara, and Araxa, these tombs can be counted by hundreds in the sides of the cliffs.

The most elaborate tomb in Asia Minor was the Mausoleum erected by Queen Artemisia in memory of her husband Mausolus, and celebrated on account of the beauty of its sculpture and the fame of the artists who executed it. The chief attempted restorations since its discovery are those of Newton and Pullan, Fergusson and Dr. Oldfield, whose clear and unbiassed description in the *Archæologia* of 1896 may lead to other versions.

Of the architecture of the Byzantine Empire comparatively little is found in Asia Minor; it is possible that some of the earlier churches have been converted into mosques, and of these there are two examples at Trebizond. The other examples given in Texier are the churches of Ancyra, Cassaba, and Myra. In these examples the prothesis and diaconicum are found, which show that they are posterior to Justin II., and the comparatively low elevation of the drum carrying the dome suggests that they were built before the ninth century, when the drum began to be raised higher to obtain more light from the windows pierced in it.

The last architectural phase in Asia Minor is that which was developed under the Seljuk Sultans, and whose chief interest lies in the fact that it forms the foundation of the Turkish Saracenic style.

It was toward the end of the twelfth century that the Seljuk Sultans developed a style of their own, largely based on Persian work. Their art, however, was more decorative than constructional, and whilst the portals of their mosques and the entrance gateways of their medressas or universities are conspicuous by the elaboration of their ornament, a close inspection reveals that their intricate patterns are an attempt to reproduce in carved stonework that decoration which the Persians produced, and much more happily, in brilliantly coloured fayence. Compared with the earlier work in Persia, or the numerous developments in Cairo, the constructive value and reason of the stalactitic vault, either in the pendentives which carry the domes, or in the half vault of the great portals, or even in the cornices or capitals, in Seljukian work is entirely lost on account of its want of due projection and its elongation. The most remarkable buildings are those found in Sivas, built between 1211 and 1274; Kaisariyeh, in the mosque erected by Houen, 1238; Konieh, palace and mosques; Nigdeh, the mosque of Ala-ed-Din, 1223, and the tomb of Fatma Khadoon, 1344, one of the most beautiful buildings of the style. The conical roofs with which all the Seljukian tombs are covered, in contradistinction to the domes which surmount all Persian and Cairene tombs, are probably derived from Armenian and Georgian prototypes. All of these are represented in Texier, *Asie Mineure.*

— R. Phené Spiers.

The architectural history of Asia Minor has hardly been attempted previously to the preparation of this paper. What is known of the buildings on the seacoast is to be found in books mentioned in the bibliography of Grecian architecture; and that which recent explorations of the interior have recorded is to be found in certain large books of travel like Petersen's *Kleinasien*, which are not architectural treatises. Professor Ramsay's explorations, some of which are recorded in the publications of the Archæological Institute of America, are full of suggestive remarks. Also see, besides the books mentioned in the text, Texier, Charles, *Asie Mineure, description géographique, etc.*; Falkener, Edward, *Ephesus, etc.*; Pottier, Edmond, and Reinach, Salomon, *École française d'Athènes, la Nécropole de Myrina, recherches archéologiques exécutées . . .*, Paris, 1887; Niemann, George, and Benndorf, O., *Reisen in Südwestlichen Klein-Asien*, Band I., *Reisen in Lykien und Karien . . . mit einer karte von Heinrich Kiepert*, Band II.; *Reisen in Lykien, Milyas und Kibratis*, Vienna, 1889; Humann, Karl, and Puchstein, O., *Reisen in Kleinasien und Nord Syrien, Ausgeführt im auftrage der Kgl. preussischen akademie der wissenschaften*, Berlin, 1890; Lanckorónski, Karl, Niemann, G., and Petersen, E., *Städte Pamphyliens und Pisidiens . . .*, Vienna, 1890.

ASPHALT. *A.* Natural mineral pitch or bitumen, as from the great Pitch Lake in the Island of Trinidad.

B. An artificial compound, as of coal tar, sand, and lime; or of natural asphalt (*A* above) or some other form of bitumen with vegetable pitch, sand, and other ingredients.

Either of these preparations is used for street paving, and for making walls and vaults watertight.

ASSEMBLY CHAMBER; ASSEMBLY HOUSE. Among the American Indians a structure built for meetings, ceremonies, and festivals. Those erected by Indians of California and the Northwest are particularly so called. In certain respects the function of the assembly house is similar to that of the Kiva; it is ceremonial lodge, club house, council house, and dormitory combined. That built by the Kórak was oblong, wholly underground, about 6 feet wide by 10 feet long, and 6 feet high. An almost flat roof was supported by poles or posts, the top being on a level with the surface of the ground. The only opening was a hatchway at one side with a notched pole for descent. The Yuki made a dome-shaped house thatched with grass and covered with earth. It was large enough to contain 200 persons. The Pómo house was similar, and every seven years they built an especially large one. In Potter Valley, California, remains of one had a circular excavation for a base 63 feet in diameter and 6 feet deep. It was 18 feet high in the middle, the roof being supported on five posts, one in the centre and four equidistant between it and the edge of the excavation. Timbers 6 to 9 inches diameter were built over from the edge to the central post, then grass and brush were laid on, and the whole covered with earth. The frame of a mammoth assembly house erected by Puget Sound Indians was still standing in

1855 at Port Madison. It was 520 feet long, 60 feet wide, 15 feet high in front, and 10 feet high in the rear, the roof having but one slope. There were 37 rafters, each 60 feet long and from 12 to 22 inches in diameter. Roof and sides were of slabs or planks, as usual in that locality. (See Slab House; Kiva; Council House; Lodge; Communal Dwelling.)

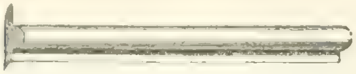
F. S. Dellenbaugh.

ASSEMBLY ROOM. A room in which *assemblies* in the sense of social gatherings, balls, etc., are held. The term was common in England in the eighteenth century, and is still in use, especially in the United States.

ASSURANCE. (See Cailleteau.)

ASSYRIAN ARCHITECTURE. (See Mesopotamia, Architecture of.)

ASTRAGAL; ASTRAGALUS. *A.* A small moulding of rounded, convex section. When plain it is more commonly called Bead (which see), but it is very often, in classic and neoclassic architecture, cut into a row of slightly marked rounded parts.



Astragal.

B. A moulded strip applied to one or both meeting stiles of a pair of folding doors. It projects past the edge so as to overlap the adjoining stile when the doors are closed.

C. Sometimes, a sash bar.

ASTYLAR. Without columns, or without the habitual use of columns in important positions and as influencing the design; said of a style or a system of design. The opposite of this term is Columnar.

ASYLUM. *A.* Originally a place of sanctuary where persons escaping from justice might be saved; the term adopted in its full significance from the Latin, in which sense Rome is said to have been made an asylum by Romulus, and in which sense also the Capitoline Hill between the Citadel and the highest point, where the Temple of Jupiter stood, was the actual place of refuge.

The district called Blackfriars in London maintained its right of asylum as late, at least, as the reign of Mary I., and that called popularly Alsatia, but more properly Whitefriars, retained its right of sanctuary until it was formally abolished in 1697. (See Sanctuary.)

B. In modern usage a building or group of buildings intended as a refuge for the sick or the destitute. It may be considered to differ from Hospital in that the hospital is rather a place for the care and cure of disease, the asylum a place of refuge for those who need care rather than medical treatment. In this sense, used peculiarly as an abbreviation for insane asylum and as a more delicate expression than Madhouse. (For the planning and architectural character of the building, see Hospital.) — R. S.

ASYMMETRY. Lack of symmetry. The term may be used to imply a defect, as when it is said that buildings of a given epoch suffer from *asymmetry.* It is more often used as implying a quality which is good or evil as one may judge it. The term "Symmetry" of which this term is the opposite and negation, is itself of a very loose and general significance. Thus an irregular building or group of buildings may be considered by one critic lacking in proper symmetry, and by another as characterized by a symmetry, so subtile as to be often overlooked, — and this may be asymmetrical to either of these critics, the term covering both characterizations. — R. S.

ATCHIEVEMENT. Same as Achievement.

ATELIER. A workshop or studio; the French term naturalized in English for an artist's studio, and, especially, for one of those studios in which pupils are trained in any fine art. (See École des Beaux Arts and Architect, The, in England; Architect, The, in France; Architect, The, in Italy. Compare also Painting Room; Studio; Workshop.)

ATLANTES (pl.). Figures of men used as supports or apparent supports. (See Caryatid; Telamon.) Atlantes are rare in architecture before the seventeenth century, their use being limited to two or three known instances of which the most important is the great temple at Akragas, in Sicily. In the later neoclassic work they are common. (See Baroque; Neoclassic Architecture; Rococo.)

ATLAS. The singular form of Atlantes.

ATRIUM. *A.* In Roman building, the principal room of an early and simple house. The hearth for cooking was in it, and the word "culina," or special cooking room, is of later date; hence, in small Pompeian houses the room with the hearth is named "atrium" or "culina." In more elaborate dwellings, a small court, only partially covered by a roof, the rain upon which fell through the opening in the middle. In the large houses known to us in Pompeii and Herculaneum the term "atrium" is applied to a smaller and less pretentious court, the larger ones being called "peristyle" or "garden." Vitruvius, however, employs the term "cavædium" as that most common in his time, — that of the early Empire.

B. In early Christian ecclesiology, the court in front of a basilica, usually surrounded by covered ambulatories in the manner of a cloister. In most instances, the space of the atrium has been occupied by other buildings, but a few remain in very perfect condition, as notably that of S. Ambrogio at Milan. (See Basilica; Etruscan Architecture; House; Roman Imperial Architecture.) — R. S.

Corinthian Atrium. One in which a number of columns were used to carry the frame of the compluvium. This, then, was a small peristyle.

Displuviate Atrium. (Cavædium Displuviatum; Vitruvius.) One in which the opening in the roof was not a compluvium, as the roof sloped the other way, and the water was carried outward toward the walls and so to gutters and leaders.

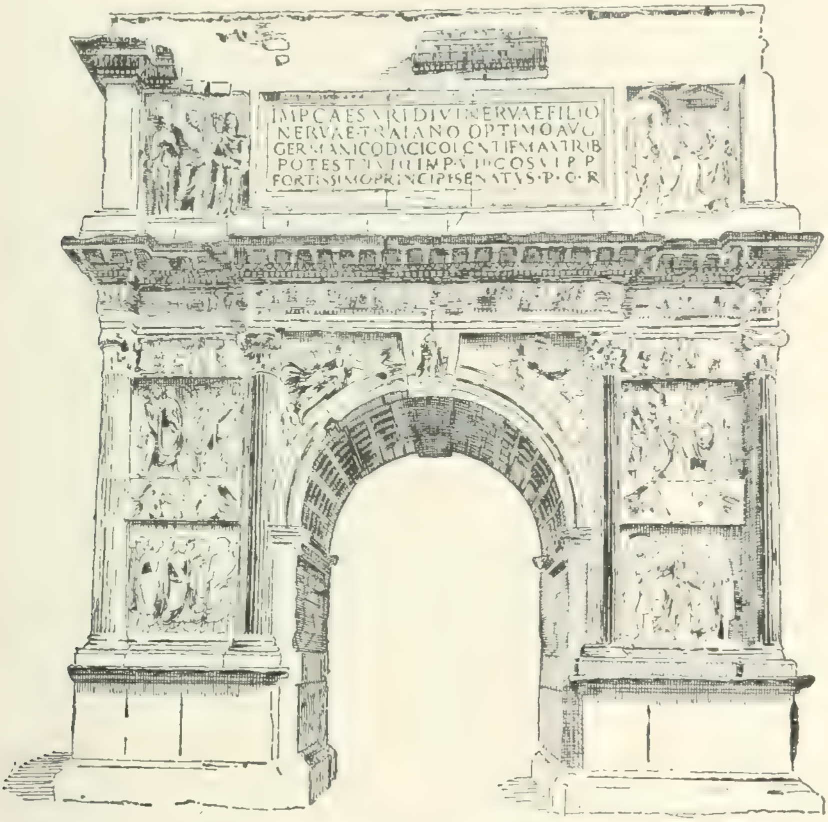
Tetrastyle Atrium. One in which the four corners of the frame of the compluvium are carried on four columns, while no other columns were used.

Testudinate Atrium. (Cavædium Testudinatum; Vitruvius.) One in which the roof was complete, without opening. This seems to be a survival of the earliest form, where the atrium was a mere sitting room.

Tuscan Atrium. One which has no columns to carry the roof, the compluvium being merely a square framed opening like a skylight. This is unquestionably the early Italian form.

ATTACHED COLUMN. Same as Engaged Column (which see).

ATTACHMENT PLUG. (See Electrical Appliances.)


IMPCAESARIDIVINERVAEFILIO
NERVAETRAIANO OPTIMOAVG
GERMANICODACICOPONTIFMAXTRIB
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FORTISSIMOPRINCIPISENATVS·P·Q·R

ATTIC: ARCH OF TRAJAN, BENEVENTO.

Having a very lofty attic bearing inscriptions and two bas-reliefs.

ATTIC. *A.* Something built above the wall cornice; a low story with windows, or a mere blank wall, but not a pierced or open parapet. The use of the term is confined to neoclassic buildings in which an additional story above the cornice is sometimes added in this way, this device being employed either to diminish the apparent height of the front, or as an afterthought. A purely ornamental construction above the entablature receives this name also, as in the Forum of Nerva (Forum Transitorium) at Rome. (See Façade; also Neoclassic Architecture; Renaissance; Roman Imperial.)

B. A story at the top of a building comparatively low and unimportant; as if built behind the architectural attic (definition *A* above). (See Attic Story; also compare Basement.)

R. S.

ATTIC BASE. (See Base.)

ATTIC ORDER. A subordinate order, as of pilasters, used to adorn the front of an Attic (which see).

ATTIC STORY. The story behind an Attic in sense *A* and the same as an attic in sense *B*.

ATTRIBUTE An object, as a weapon, a flower, or the like, considered as expressing the character or authority of a divinity; thus the dove is a recognized attribute of Venus in Roman and modern mythology. (Compare Emblem; Symbology.)

ATWOOD, CHARLES B.; architect; b. 1849, at Charlestown, Massachusetts; d. Dec. 1895, at Chicago.

Atwood was educated at the Lawrence Scientific School of Harvard University. He worked for several years in the office of Ware and Van Brunt (Boston), and in 1872 began business on his own account. In 1875 he took charge of the architectural work of the firm of Herter Brothers in New York City, and in that capacity designed much of the detail of W. H. Vanderbilt's house on Fifth Avenue. Atwood was chosen designer in chief to the World's Fair in Chicago and designed the Peristyle and Art Building for that exposition.

American Architect, Vol. L., p. 141.

AUBELET, JEHAN; architect.

In 1401 Jehan Aubelet, *maître d'œuvre du roi*, with his nephew, Jehan Prévôt, was sent by Raymond du Temple (see Temple, R. du) to inspect the works at the Cathedral of Troyes (France). In 1403 Aubelet became *maître des œuvres* to the Duke of Orleans.

Assier, *Les arts et les artistes dans l'ancienne capitale de la Champagne*.

AUBRIOT, HUGUES; *prévôt de Paris.*

Before 1369 he completed the second wall of the city of Paris (*l'enceinte de Charles V.*) begun by his predecessor Étienne Marcel. He laid the first stone of the historic Bastille (Paris) April 22, 1370. The building was finished in about four years. This work brought upon him the animosity of the people. He was condemned by the bishop of Paris and himself imprisoned in the Bastille, March 1, 1382. He escaped to Dijon, where he died soon after.

Hoffbauer, *Paris à travers les âges*.

AUDIENCE CHAMBER. A room in which a formal reception or meeting is held, as, especially, in a palace, as it is the sovereign generally who is said to grant audiences.

AUDIT HOUSE; ROOM. In England, a house or room used for the transaction of business connected with a cathedral, and, therefore, usually located in the cathedral close.

AUDITORIUM (I.). *A.* In any building intended to receive an audience, as a church, a theatre, or the like, that part which is especially appropriated to the audience when listening to an address or concert, or watching a performance, or the like. (See Acoustics; Amphitheatre; Concert Hall; Theatre.)

B. A parlor in which the inmates of a monastery or similar institution are allowed to see visitors.

AUDITORIUM (II.). A building in Chicago, Illinois, which contains a theatre, many business offices, and a large hotel. It occupies one end or side of a large block, and fronts on three streets, having also a fourth front on a narrow alley. The Auditorium Annex is at the other side of the street upon which the main building faces, and is connected therewith by a tunnel under the roadway.

AUDRAN, CLAUDE; painter and decorator; b. Mar. 27, 1639, at Lyons; d. Jan. 4, 1684.

The family of Audran furnished five generations of artists represented by sixteen individuals, most of them engravers. Claude Audran was a pupil of Noël Coypel and assisted Errard in the decoration of Versailles, the Louvre, and the Tuileries. He assisted Charles Lebrun (see Lebrun, Ch.) in many important undertakings. The more famous engraver, Gérard Audran, was a younger brother.

Genevay, *Style Louis XIV*.

AUGUSTÆUM. A building, or a temple, dedicated to the deified Augustus, as that at Ancyra in Asia Minor.

AULA. A hall or large room; the late Latin term used in mediæval Latin documents and rarely in modern English.

AUMBRY; AUMERY. Same as Ambry.

AUREOLA; AUREOLE. A glory which surrounds the whole figure of the divine or sainted personage. (See Glory; Halo; Nimbus; Vesica Piscis.) On the tympanum of a Romanesque or early Gothic church, Christ is often represented surrounded by an aureole.

AURIGA, HERMANN; architect and engineer.

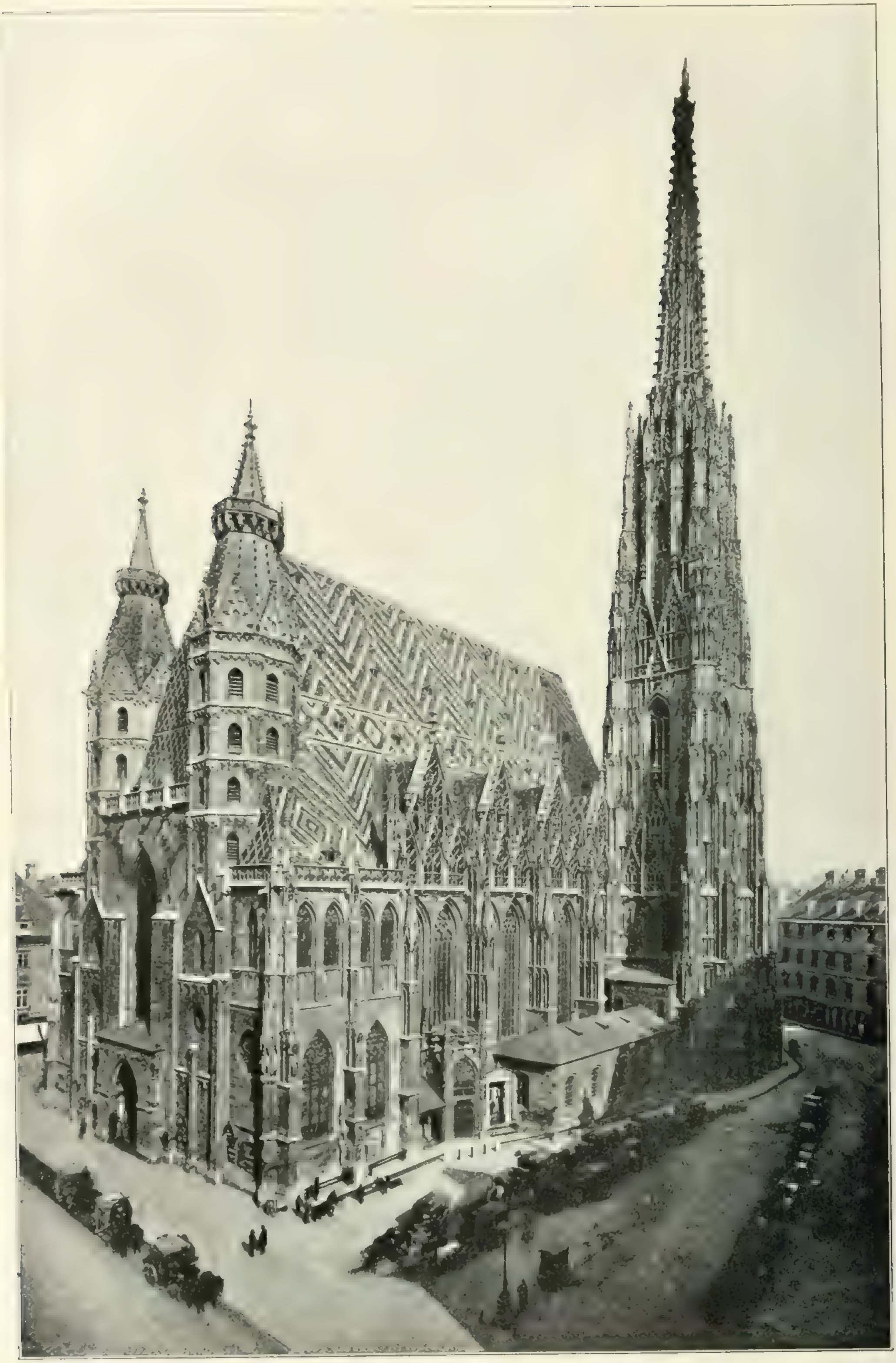
At the end of the twelfth century (1190–1202) Bishop Conrad von Hunenbourg undertook the second enlargement of the walls of the city of Strasburg. He built a double line of fortifications with three gates. On one of these gates, which existed in the last century, was the statue of the architect employed on the work and the inscription, "Hermannus Auriga magister hujus operis." It has been conjectured that Auriga was architect of the choir and transept of the Cathedral of Strasburg, built at about this time.

Gérard; *Les Artistes de l'Alsace au Moyen Âge*.

AUSTIN, GEORGE; architect; b. 1787; d. 1848.

The Cathedral of Canterbury was allowed to decay until about 1819. Only mechanics were employed to care for it, and important parts of the building were in ruin. George Austin, a resident of Canterbury, urged the necessity of intelligent care, and was placed in charge of the monument. He restored the entire building. His restoration of the south-

PLATE V



AUSTRIAN STATES

Cathedral church of S. Stephen, Vienna. The west front is of the thirteenth century, but the south flank and splendid south tower are of about 1360 and the following years. The church is peculiar in that it has no clearstory whatever, but is a *Hallenkirche*, with the nave and two aisles of nearly the same height.

eastern transept and northwestern tower were remarkable feats of engineering.

Builder, Vol. VII. (1849), p. 205.

AUSTRALIA, ARCHITECTURE OF. The natives of Australia were few in number when the land was first explored by Europeans, and were of a low type of savagery. They had no houses nor roofed buildings of any sort; using screens as a shelter from the wind in summer, and in winter building low huts of bark or of slender poles tied together at top and covered with mud, with the one opening turned to leeward, and without door or opening for window or chimney. (See Mia-Mia.)

The settlers of European stock have built two cities, Melbourne and Sydney, of over four hundred thousand inhabitants each, and nine more of twenty thousand or over. These are generally laid out with very wide streets, reservations for parks, sites selected deliberately for public buildings, and all the usual and proper consideration for the needs of a large population; but as yet little of importance in the way of architectural art is noted. The public buildings are convenient, but in style are rather close copies of modern English architecture of the more conventional and less interesting type. Thus, in Adelaide, South Australia, a city admirably laid out with most sagacious provision for future needs, the buildings generally do not demand attention. The town hall and the Supreme Court building are of late neoclassic character, with pilasters and colonnaded porticoes of an ordinary sort; although the latter building is of good general proportions. In the same town, the Parliament house of the colony is in process of rebuilding, on a much larger scale than at first and in a neoclassic style. The Anglican cathedral is, however, an important structure, designed by William Butterfield and in the best style of that remarkable artist.

In the colony of New South Wales, the city of Sydney is picturesquely situated, with its suburbs, around a beautiful bay, and is one of the most attractive new cities in the world; but the architectural character of its public buildings is not high nor very unusual. The town hall is of a rather florid neoclassic design with two orders superimposed. There are open porticoes in two stories with coupled columns, and these are repeated and carried along the front by systems of pilasters; there is also a high square tower of good general design rising from the roof above the porticoes. The university buildings have been begun on a very large scale in the modern Gothic style. Saint Andrew's Cathedral is of moderate size; a perpendicular Gothic design by T. Blackett. There is also a large Roman Catholic cathedral in progress, the design of W. W. Wardell, geometrical English Gothic, apparently studied from Lincoln Cathedral. The government house, of elaborate Victorian Gothic style, with towers, lies in fine grounds, a part of which is used as the botanic garden. That which a new and growing city needs seems to be done or doing in a good way; but, except for the cathedral, no important artistical or constructional peculiarities are brought to our attention.

On a still larger scale are the buildings of Melbourne, the capital of Victoria. The houses of Parliament are of elaborate neoclassic design: a portico with ten columns *in antis* between wings decorated by pilasters, the whole forming a colossal order. The Roman Catholic cathedral, by W. W. Wardell, is of English Gothic. The Anglican cathedral, by Butterfield, is a remarkable design with free use of colour.

Until a careful study of the houses built by early settlers and by later wealthy sheep farmers and cattle raisers shall have been made, there will be nothing of especial interest to record concerning the architecture of Australia — always excepting the chance of important buildings of truly artistical character being undertaken. That which would be interesting to a foreigner in the United States would not be the grandiose buildings of the cities so much as the naturally developed frame buildings, sheathed and protected with boarding and shingles, which have grown up with the very life of the people; and the same conditions exist in the case of the prosperous British colonies of the Pacific Ocean. We desire to know wherein their unsophisticated system of building differs from the log house and the frame house of the English speaking nations of America; but as yet no student has brought us this information. — R. S.

"Architecture of the Colony of Victoria," Australia, *Journal R. I. B. A.*; James Barnet, "Architectural Work in Sydney, N. S. W.," Vol. VI., No. 17, July, 1899, *Journal R. I. B. A.* The literature of the subject is of little extent or importance, and photographs are hard to obtain.

A part of the information contained in the above article is furnished by Mr. R. Phené Spiers.

AUSTRIA HUNGARY, STATES OF THE EMPIRE OF. (See Austrian States; Bohemia; Croatia; Dalmatia, under Balkan Peninsula; Hungary.)

AUSTRIAN STATES, ARCHITECTURE OF. Austria; the provinces of the empire excepting Bohemia, Hungary (which see), with its dependencies and the Adriatic coast (for which last see Balkan Peninsula). It may, at first, appear remarkable that the Austrian dominions should present fewer examples of mediæval architecture, especially churches, than any other German lands; but a study of the history of the country will supply one reason for this, the continued wars with Hungary, Poland, and Turkey, and the fact that large portions of the country were for many years absolutely in the possession of the Turks. It may be doubted whether the Austrian churches ever equalled those of the north and west of Germany, but whether they did or no, they certainly do not at the present day.

Nature, also, seems to have conspired against Austrian architecture. Scarcely a building has escaped earthquake, tempest, or fire. It is a remarkable and certainly a fortunate circumstance that that which must always have been the finest church in these dominions is the best preserved; this comes about by chances that it is almost impossible to describe. The great Cathedral of S. Stephen at Vienna, with its stately interior, magnificent spire, and graceful details of every description, even to its internal fittings, monuments, and stained glass, is a storehouse of graceful architecture. We will simply note that the west front, with its octagonal spire-capped towers, is a valuable example of the beautiful Danubian architecture of the thirteenth century which we find further exemplified in those abbeys, or portions of them, which have escaped destruction or rebuilding.

Perhaps the most interesting of these is the Abbey of Heiligenkreuz in the Wienerwald. The nave of the church is rich Romanesque work, but there is a magnificent fourteenth century "Hallenbau" choir. The most valuable portions, however, are the cloisters, chapter house, and "Brunnen" house or monks' lavatory, in the same style as the works to which we have alluded in Ratisbon (see Germany, Architecture of) as being of that beautiful thirteenth century Gothic almost peculiar to the Danube.

Another abbey, almost equally remarkable, is that of Zwetl, in lower Austria, which is of a very similar description, with the same arrangement of chapter house, cloisters, "Brunnen" house, etc., attached to a grand Gothic church built in 1343–1348.

A third fine old abbey of very similar architecture is to be seen at Trebitch in Moravia, with a large Romanesque crypt and magnificent west doorway.

The abbeys of Klosterneuburg and Lilienfeld, both in Lower Austria, possess cloisters and other portions of this same beautiful architecture, though the church of the former was rebuilt in the seventeenth century and that of the latter very much modernized.

The Abbey of Sekkau, near Gratz, has a fine church of the earlier school of Romanesque work. The little Cathedral of Gurk in Carinthia, with its remarkable crypt and richly sculptured western portal, is an example of most highly elaborated late Romanesque.

The Cathedral of Wiener Neustadt, 1240–1245, an extremely graceful specimen of very early Gothic, is certainly the oldest in this part of the country.

Of more developed Gothic are the Church of Strasso-Engel near Gratz, S. Marien Stiegen, and the magnificent cathedral, at least its nave and choir. Of the later or flamboyant Gothic, there is a very perfect example in the great church at Steyr, a rich church with fine stained glass and carving. And, of course, the great and justly celebrated south tower of S. Stephen's at Vienna may be regarded as the masterpiece of this style of architecture.

Although Austria contains few Gothic buildings, some of them, as may be seen from the list we give, are works of great interest and beauty, showing vigorous and graceful detail of a very similar description to that most excellent school of Ratisbon. Unfortunately, these Gothic churches are so few in number as to be completely lost and buried amongst the dreary and overwhelming mass of buildings of the very worst rococo in the whole of Europe.

Why the late neoclassic church architecture of Austria should be so poor, and yet the palaces of the same period often so striking, is very difficult to say. The seventeenth and eighteenth century palaces possess a stateliness and grand solidity of treatment which reconciles one to the wildness and extravagance of some of the detail. Their great and powerfully designed doorways, with projecting canopies supported by giant caryatides, present a very grand appearance. One of the best masters of this style was Bernard Fischer von Erlach, who built the only fine neoclassic church in Vienna, that of S. Karl Borromeo.

The nineteenth century architecture of Vienna is of more than ordinary interest. The Palace of Justice, by Wielemans, 1881, is a finely treated example of Italian Renaissance very magnificently carried out.

The Parliament House, by Van Hausen, 1883, is a somewhat severely treated Greek building.

The university, by Ferstal, 1883, is Renaissance of a rather cold kind, but dignified.

The court opera house, by Vandernul and Siccardsburg, is a splendid work of more freely treated Renaissance style.

The town hall, by the late Professor Schmidt, is a vast Gothic building with a slight admixture of classical detail magnificently carried out, and a great ornament to the town.

There are many churches built by Schmidt, all of the Gothic style, though one is crowned by a great dome very skilfully treated. The large but very simple church of the Lazarists is a scholarly work.

Of course, the most important modern church in Vienna is the Heilands Kirche, an extraordinarily elaborate work by Ferstal in the Cologne type of Gothic. Though carried out regardless of cost, its proportions are not satisfactory.

The Tyrol and Salzburg

Although the churches of the Tyrol are not fine examples of architecture, they contain much beautiful furniture, especially carved altarpieces of great intricacy and beauty.

The Innsbruck churches are almost entirely of the late Renaissance type, but the Hoff Kirche contains the superb monument of the Emperor Maximilian I. by Colin of Mechlin, which is surrounded by twenty-eight bronze statues of magnificent workmanship.

Frequent fires have left few mediæval buildings in this town. The cathedral, 1614–1655, is a poor imitation of S. Peter's, Rome, but contains the most magnificent bronze font in Europe, dated 1321.

S. Peter's, a very much modernized Romanesque church, is surrounded by a very ancient cemetery with picturesque fifteenth and sixteenth century memorials.

The church on the Nonberg has an ancient crypt and cloisters of a very early date, with ancient wall paintings and a superbly carved altar.

Mittelalterl. Kunstdenkmalen des Oesterreich. Kaiserstates; Ernst und Oescher. *Baudenkmale des Mittelalters in Erzherzogthum Oesterreich*; *Allgemeine Bauzeitung* (about 30 vols.); Auer und Lange, *Monuments de Vienne*; *A Magyar Mérnok Egyles Heti Ertesitöje*, Budapest. And see Bibliography, Germany, Architecture of.

— H. W. Brewer.

AVANT-CORPS. That part of a building which projects prominently from the main mass, or a pavilion almost wholly separated from the main building and advanced in front of it; the French term often used in English.

AVENUE. A way of approach or of exit, or, in a general way, for circulation; a term of very general application. Especially: —

A. A street in a town; usually a wide and straight one, and often with some pretensions to treatment in the way of landscape, as with trees and shrubs. *Unter den Linden* in Berlin is a well-known type, and there are in Paris avenues in this sense.

B. A drive in a park or private country place, more especially the principal drive from the main entrance to the house; a term not often used unless the drive is straight or nearly so.

C. By extension from *B*, a double row of trees; the space between them and on either side being without other roadways or paths.

R. S.

AVERULINUS; AVERLINO. (See Filarete.)

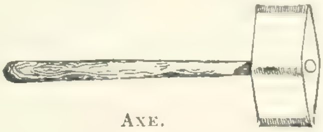
AVERY ARCHITECTURAL LIBRARY. Founded in 1890 by Samuel P. Avery and Mary O. Avery, his wife, of New York City, in memory of their son, Henry Ogden Avery, architect. The ownership of the books is vested in the Trustees of Columbia University in the city of New York, and the purchasing of books and the general supervision of the affairs of the library is in the hands of a committee especially appointed by the deed of gift. The amount of the gift on the first day of July, 1899, including the invested fund and the purchases, binding, etc., to that date, has reached $68,584.87; to which are to be added gifts, from time to time, of books, prints, and the like, amounting to about $10,000 more. The costly character of the large majority of the books prevents the comparison, per number of volumes, with libraries in other departments of knowledge, but the number of separate volumes in the library was, on the above date, 15,566.

— R. S.

AXE (I.). In French, the axis; the central or determining line.

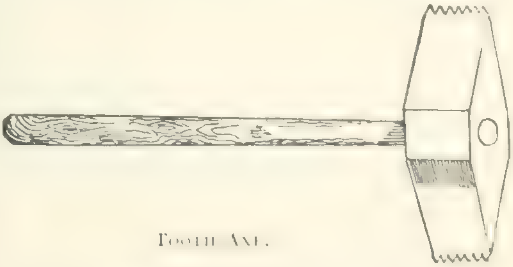
En Axe. In French, placed upon the axis, as of something else; or symmetrically disposed about the axis. A monument is said to be *en axe* with a street when the centre line of the street passes through the centre of the monument. Two rooms are said to be *en axe;* or an opposite window or door, or two opposite doors, are said to be *en axe* when the axis of the room, pavilion, wing, or whole building passes through them, or even when they are centred upon one another with deliberate care to bring them exactly opposite. The term, being entirely French, is taken over into English with many abuses and misunderstandings. (See Axis.) — R. S.

AXE (II.). A form of Peen Hammer used for the rougher kinds of stone dressing. Its head has the form of a double wedge with its two edges parallel to the handle.



Axe.

Tooth Axe. Similar to the above, the edges having teeth. Used in finishing the face of the softer kinds of stones or in preparing them for a still finer finish. (See Stone Dressing.)



Tooth Axe.

AXE (v.). To dress or face stone by means of the stone mason's axe. (See Axe, II.) The term is often extended to include work done with the Patent Hammer (which see). It is customary to face granite and all granitic rocks in this manner, while softer stones are tooled. Bluestone, also, the hard sandstone known by that name in New York City, is often treated in the same way.

AXIAL. *A*. Pertaining to an axis, as in the expression, an axial line.

B. Situated on an axis, as any member of a building, either existing or shown in a drawing. The term is not common in architectural writing, but occurs sometimes as a substitute for *en axe* (which see under Axe, I.) and to avoid circumlocution.

AXIS. *A*. In architectural drawing, a central line, not necessarily intended to form a part of the finished drawing, but laid down as a guiding line from which may be measured figure dimensions of rooms, the widths of openings, etc. A primary axis may pass through the middle of a Ground Plan (which see), in either direction, or, vertically, through the middle of a Section or Elevation (which see). There may be as many subsidiary axes as the different rooms, wings, pavilions, or other primary parts of the building may require.

B. An imaginary line to which is referred the parts of an existing building or the relations of a number of buildings to one another. Thus, in Greek architecture, the buildings standing on the Acropolis of Athens, or those within the sacred enclosure at Epidauros or Olympia, have each a distinctly marked axis, but have no common axis that modern explorers have been able to fix. Such buildings are, indeed, set at angles with one another so obvious that the idea of a common axis is precluded. On the other hand, the great temple at Karnak in Egypt has a bent or deviated axis; that is to say, while the first three or four halls and courts have evidently been carefully arranged upon one axis, those that follow are arranged upon another axis, making a very slight angle with the former one. A similar deflection occurs in many mediæval churches, and a legend exists, very hard to verify, according to which this change of direction from the nave to the choir is intended to suggest the reclining of the Saviour's head upon the cross. All careful planning is done with some reference to an axis, but the designers of different schools disagree widely as to the value to be given to the placing of buildings and parts of buildings accurately upon an axis, or as it is called, following the French term, En Axe (which see, under Axe, I.). Thus, to the designers of one school, it seems almost essential to put a monument, a fountain, or the like upon the axis of a street, while to the designers of another school it might even be thought desirable to avoid that. This seems to imply a preference for regularity and exactness in the one case and a preference for picturesque effects in the other; but it is to be observed (see Street) that when men are planning a quarter of a city deliberately, the instinct seems to be to arrange the streets at right angles and in this way to consider axes rather carefully. Deliberate picturesqueness of effect is hard to attain. (See Architecture; Design (I.); Symmetry.) — R. S.

AYA SOPHIA. (Also Ayiah Sophia, and in other forms.) The Church of S. Sophia in Constantinople. This being the common Turkish appellation.

AYA SOFIA, MOSQUE OF. (See Church of S. Sophia.)

AYUNTAMIENTO, CASA DE. In Spain, a building used by the city government or for law courts. Some of these, in the Spanish cities, are of great interest as pieces of neoclassic architecture. That of Seville is the most celebrated, and is, perhaps, the richest piece of plateresco decoration. (See Plateresque.)

AZTEC ARCHITECTURE. That of the Nahuatl or Aztec tribes of Mexico. (See Mexico, Architecture of, Part I.) Popularly applied to all pre-Columbian Mexican architecture. — F. S. D.

AZULEJO. In Spain, a glazed and decorated tile of earthenware. The term means, originally, a blue object, and was limited to the blue painted tiles brought from the Netherlands; but in the language of collectors and students it means now the tiles of brilliant colour and often of semi-Moorish design which were evidently made in Spain. The peculiar characteristic of these tiles is the slight relief given to the edges of the coloured patterns.

B

BABYLONIAN ARCHITECTURE. (See Mesopotamia, Architecture of.)

BACCIO D'AGNOLO. (See Baglioni, Baccio.)

BACCIO DA FIRENZE; sculptor and architect.

Baccio and Giovanni da Firenze made the important monument of Robert of Anjou in the Church of S. Chiara in Naples. Two documents relating to this work are dated 1340 and 1345. Nothing more is known about them.

Maresca, *La Tomba di Roberto d'Angiò in Napoli*.

BACK. *A*. The more remote or further side of any member or part of a building, or what may have seemed more remote to the designer.

B. The rear of a building, in any sense. Where both of the longer faces of a large building are treated with nearly equal architectural effect, that face which has not the principal entrance will be the back. Churches, while they often have a front, can hardly be said to have a back, because the chancel end, commonly called the east end (see Orientation), is peculiarly important in the ecclesiological sense, and frequently has exceptionally important architectural features.

In the plural, as "the backs," that side of a long row of buildings which is opposite their principal fronts, as in Cambridge University (England), where the term covers the buildings as seen from the river.

C. The top or upper surface or portion of a member, as the back of a hand rail; the back of an arch, meaning the extrados.

D. In composition, the reverse or inner side; a lining or the like. (See Chimney Back; Panel Back; Window Back.) — R. S.

BACK (v.). To provide with a proper back; to finish the back of; especially, to trim or adjust the back or top of a rafter, joist, or the like, to the proper level of the whole tier. Often with a preposition, as, to back off, to finish the back of masonry or the like by cutting away projecting portions.

BACK AIRING. (See Back Venting.)

BACK BAR. In the United States, a counter or shelf extending along the wall of a barroom behind the bar. It is generally formed by a series of refrigerators, cupboards, and the like, on the top of which glasses, bottles, etc., are kept. (See Bar.)

BACK CHOIR. Same as Retro-choir.

BACK FILLET. The exposed edge of a slightly projecting quoin, architrave, or the like; the fillet by which it returns to the face of the wall.

BACK FILLING. *A.* The rough masonry forming the mass of a wall, built in behind the facing or between the two faces; similar masonry or earth, and the like, used as a filling over the back (or extrados) of arched constructions, as tunnels and sewers.

B. In some frame buildings, the rough brick masonry used to fill up the space between the studs.

BACK FLAP. In a folding shutter, door, or the like, composed of two or more parts hinged together, that one which comes behind the others and next to the jamb when the shutter is open and folded back at the sides of the opening. Usually, the back flap is the one nearest the middle when the shutter is closed across the opening.

BACKGROUND. *A.* In a piece of sculpture in relief, the surface, approximately flat, against which the figures and other details of the composition are relieved. A carved panel, as of a cabinet or in a wainscoting, will often have this background perfectly flat and in one plane, the sculpture being relieved upon it as exactly as if it had been (as it sometimes is) carved separately and applied. In figure subjects the background will often be in several different planes, which may even be not parallel with one another, or may in parts be concave, or not a plane surface at all. Thus, that part of it which is seen around a head or between the heads of the figures will not be exactly in the same plane as that at their feet. The more elaborate the composition, the more probable is this arrangement. Thus, in the celebrated bronze doors by Ghiberti, in the Baptistery at Florence, the crowd of details of suggested landscape, with buildings, fortifications, plant form, and the like, so surrounds and accompanies the human figures that these last have more commonly a background made up of those other details than a flat field of any sort. In like manner, there is one panel in which the upper space is filled by the arcades of a great building seen in slight relief, and in several others, architecture, in one form or another, fills the whole, or nearly the whole, of the distance. In one panel, rocks and distant trees fill the upper part of the panel almost into the corners. Although a large number of students of art object to the verisimilitude used in these reliefs, the line of what is fitting in such cases cannot be accurately drawn. The doors of the north portal of the same Baptistery, the work of the same Ghiberti, have sometimes a perfectly flat background to the figure subject in relief, and sometimes the suggestion of rough earth under the feet of the figures is carried so far that the cracked masses of bronze project beyond the mouldings which enclose the decorated panel. In wood and marble work of the post-Renaissance styles, a similar freedom is often taken; and it is to be observed that in high relief, where a head or arm is often separated wholly from the mass and treated nearly as a part of a statue is treated, the background will of necessity contain lower reliefs which serve to set off the higher parts of the relief as well as the freely rounded parts mentioned.

B. In representative or decorative work in the flat, as mural painting and the more elaborate kinds of inlay, the distance as distinguished from the objects in the foreground, the ground as distinguished from the pattern, the general surface of the wall, vault, ceiling, etc., as distinguished from what may be painted upon it, inlaid in it, or applied to it. — R. S.

BACKHOUSE. A building subsidiary to another and standing behind it; especially, in the United States, a privy, when separate from the residence.

BACKING. That which is used to fill in at the back of, or to finish on the inner or farther side of, or to support at, the back.

Specifically, the backing of an arch, the masonry resting immediately on the extrados; the backing of a wall, the masonry forming its interior face.

BACKING UP. *A.* The process of building some piece of masonry which will retain earth or sand.

B. A piece of masonry so built; a retaining wall, especially a rough and unarchitectural one.

BACK LINING. Any lining or sheathing at the back of a recess or boxing. Specifically:

A. In a cased frame (which see under Frame, I.), the vertical member parallel to the pulley stile.

B. The back of a shutter box, next to the wall, against which the shutter folds when open.

C. The sheathing, panelled or otherwise, under a recessed window against the wall. (See Panel Back.)

BACK SHUTTER. Same as Back Flap, when applied to a shutter.

BACK VENTING. The application of branch air pipes connecting with the sewer side of fixture traps for the purpose of preventing siphonage; called also Back Airing. (See House Drainage.) — W. P. G.

BADAJOZ, JUAN DE. (See Juan de Badajoz.)

BADIA. In Italian architecture, an abbey church, an abbreviation of *abbadia.* The Church of the Badia in Florence, near the Bargello, and that of Fiesole, outside the walls of the old town, are well-known buildings; the former is rich in monuments and delicate sculpture.

BADIGEON. A composition used to patch up hollows and defects in woodwork or stonework. Carpenters employ a mixture of sawdust and glue, or putty and chalk; masons, one of plaster and ground stone, or stone chippings. The term is English, of French origin, little used in the United States.

BAECKELMANS, FRANÇOIS; architect; b. April 17, 1827; d. 1896.

Baeckelmans built the Palais de Justice, at Antwerp (Belgium), the churches of Sempst, Laer, S. Armand, etc., and was professor at the *Institut Supérieur des Beaux Arts,* at Antwerp.

Construction Moderne for April 18, 1896.

BAGGAGE ROOM. In the United States, a room in a railway station for receiving, checking, and handling baggage.

BAGLIONI, BACCIO (BARTOLOMMEO D' AGNOLO; architect, sculptor, and woodworker (*intarsiatore*); b. May 19, 1462; d. 1543.

The Baglioni conducted a *Botega* in Florence where many kinds of decorative work were done. The organ of the Church of S. Maria Novella (Florence), one of Baccio's earliest known productions, has been removed. The lower part, or "cantoria," is at the South Kensington Museum, London, the upper part in the Church of Rueil, near Paris. After 1495 he assisted Il Cronaca (see Cronaca), and later Antonio da San Gallo (see San Gallo, A., I.) in the construction of the great hall of the Palazzo Vecchio, Florence. He built the Palazzo Bartolini (begun about 1520). Ascribed to him, also, are the villas Bartolini and Borgherini, and the Palazzi Ginori, Taddei, and Borgherini. In 1498 he became *Capomæstro* of the Palazzo Vecchio. He made a model for the façade of S. Lorenzo from the drawings of Michelangelo. In 1506–1515 he built a section of the cornice gallery of the dome of the Florentine cathedral, and in 1516, with Antonio da San Gallo, began the loggia opposite Brunellesco's *Spedale degli Innocenti.*

Geymuller-Stegmann, *Die Arch. der Ren. in Toscana*; Muntz, *Renaissance*, Vol. II.; Vasari, Milanesi ed., Vol. V.; Milanesi, *Lettere di Michel Angelo.*

BAGLIONI, DOMENICO DI BACCIO D' AGNOLO; architect and sculptor; b. 1511.

Domenico was the second son of Baccio d' Agnolo (see Baglioni, B.). He was considered by Vasari a more talented architect than his brother Giuliano (see Baglioni, G.). He built the Niccolini, now Buturlin, Palace in Florence, and finished the Torrigiani Palace begun by his father.

Geymuller-Stegmann, *Die Arch. der Ren. in Toscana*; Mazzanti, *del Badia*; Migliori, *Fabbriche . . . di Firenze.*

BAGLIONI, GIULIANO DI BACCIO D' AGNOLO; architect, sculptor, and woodworker; b. 1491; d. 1555.

The four sons of Baccio d' Agnolo (see Baglioni, B.) continued his work. Of these, the two oldest, Giuliano and Domenico, attained eminence as architects. Vasari employed Giuliano to execute work from his designs, and attributes many buildings to him. For Baldassare Turini he built the Capella Turini in the Cathedral of Pescia (1540), which was intended to contain a picture by Raphael. He also built the Casetta Campana at Montughi, near Florence, the Palazzo Campana at Colle in Val d' Elsa, and the Palazzo Grifoni at San Miniato al Tedesco (between Florence and Pisa).

Geymuller-Stegmann, *Die Arch. der Ren. in Toscana*; Vasari, Milanesi ed., *s.v.* Baccio d' Agnolo.

BAGNIO. *A.* A bathing establishment; this is the original meaning of the word.

B. A Turkish prison (presumably from the occasional use by the Turks of their immense baths as prisons for captives, or from the employment of prisoners as slaves in the baths).

C. In France, formerly, one of the prisons substituted for the galleys; in French, *bagne.*

D. A place of prostitution (probably from the evil reputation of many public bath houses).

BAGUETTE. *A.* A small, convex, more or less cylindrical, moulding; a bead or chaplet.

B. In old English usage, a hip roll or moulding along the angle between two adjacent planes of a hip roof.

BÄHR, GEORG; architect; b. 1666; d. 1738.

Of his early life nothing is known. It is not probable that he visited France or Italy. Bähr held the office of *rathsbaumeister* in Dresden (Saxony), and devoted his life to the developments of the architecture of Protestant churches. His most important building is the monumental *Frauenkirche* in Dresden, built between 1726 and 1740, one of the most notable domical buildings of the time.

Gurlitt, *Geschichte des Barockstiles in Deutschland*; Schumann, *Barock und Rococo.*

BAHUT. *A.* A large chest, usually somewhat ornate.

B. A species of dresser, the lower body deeper than the upper; hence, from a fancied resemblance;

C. A low parapet wall, or attic wall; especially that which carries the roofing, and is built up behind a gutter and balustrade, as in Gothic churches.

D. Any solid parapet wall. (Compare Blocking Course.)

BAIGNOIRE. A box of the lowest tier in a modern French theatre. The baignoires are usually open boxes, divided by low partitions, whose form resembles the side view of a certain kind of bath tub, whence the name. The upper tiers (*loges*) have partitions reaching from floor to ceiling.

BAILEY. *A.* The external wall of a feudal castle; hence, any similar circuit wall.

B. By extension, a court formed by such a wall.

BAILLARD (BAILLART, BILLART), CHARLES; architect.

Baillard is mentioned in the *Comptes* as *Maistre Maçon de Monseigneur le Connetable*, Anne de Montmorency (d. 1567). He was one of the inspectors of the contracts made by Gilles le Breton (see Breton, G.) at Fontainebleau (1540), and by Guillaume Guillain (see Guillain, G.) at La Muette (1548). Palustre supposes that he was employed between 1531 and 1550 by Montmorency to design and build those portions of the Château of Ecouen which were constructed before the time of Jean Bullant (see Bullant, J.). He was probably connected with the family of Biard (see Biard).

De Laborde, *Les Comptes des Bâtiments du Roi*; Palustre, *La Renaissance en France.*

BAILLY, JEAN (I.); architect; d. between 1529 and 1531.

In 1500 he was employed with Jean Garnache (see Garnache, J.) to direct the construction of the Cathedral of Troyes (Aube), France. In 1506 and 1507 he was consulted about the portal and towers of the Cathedral of Troyes which were built by Martin Chambiges (see Chambiges, M.). In 1508 he was made *Maître de l'œuvre* of the church of S. Pantaléon at Troyes.

Assier, *Les arts et les artistes dans l'ancienne capitale de la Champagne*; Bauchal, *Dictionnaire.*

BAILLY, JEAN (II.); architect and sculptor; d. August 19, 1559.

Jean, II., was the son of Jean, I., and was son-in-law of Jean de Soissons (see Jean de Soissons). May 17, 1532 he was made *Maître de l'œuvre* of the Cathedral of Troyes.

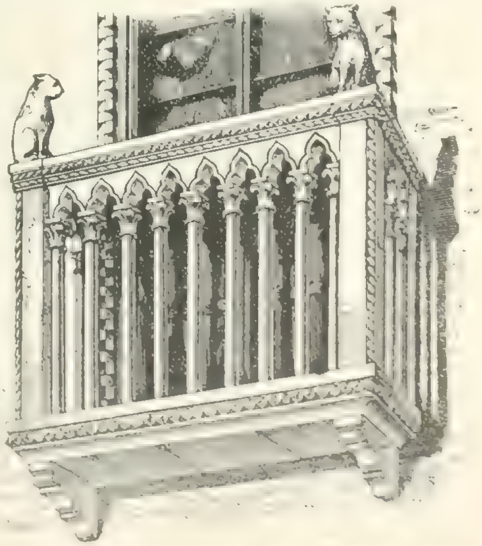
(For bibliography see Bailly, Jean, I.)

BAKEHOUSE. A building containing an oven and other necessary appurtenances for baking, as in a hospital, monastery, barracks, or the like. Under the feudal system each manor possessed a bakehouse to which tenants were obliged to resort.

BALCONE. In Italian architecture, a very large and showy window or group of several windows arranged together. The term seems to have lost wholly the original significance of a small projecting gallery, for which are used the words Ringhiera, Cantoria, Loggia (see those terms); and also ballatoio, sporto; according to the region of Italy, and the locality and character of the structure.

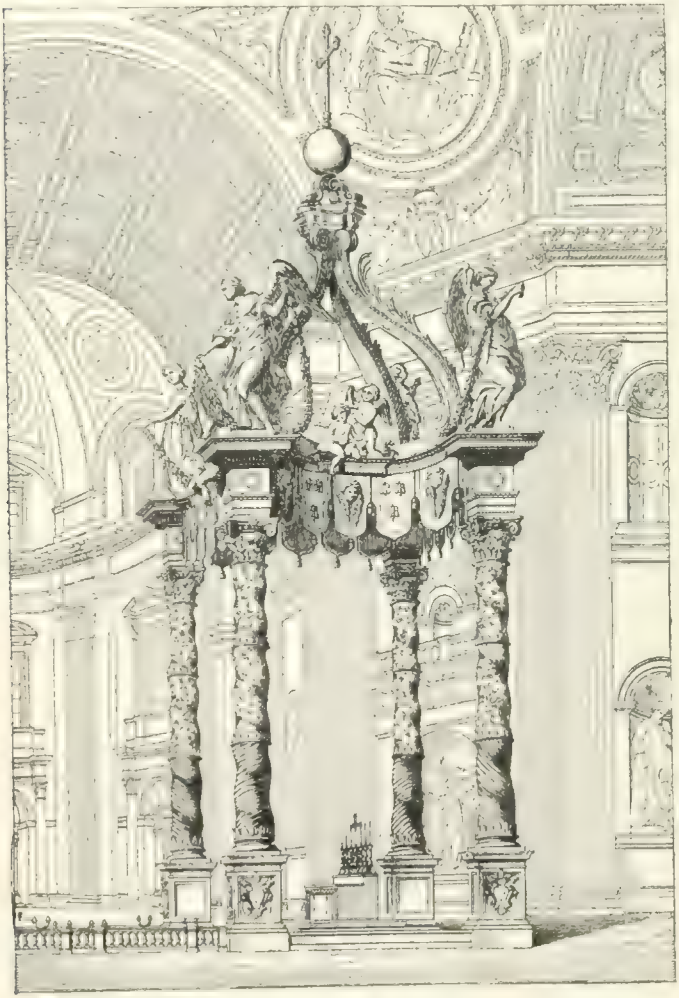
BALCONET; BALCONETTE. A railing or balustrade at the outer plane of a window reaching to the floor, and having, when the window is wide open, the appearance of a balcony.

BALCONY. A small open gallery built out from a wall and supported generally by



Balcony; Istrian Stone, 14th Century, with Shafted Balusters, and having, therefore, the Semblance of an Arcade; Venice.

corbels or brackets. The term is generally confined to an unroofed structure consisting of a floor and low parapets only, but the balcony passes readily into the Loggia (which see), and no accurate distinction can be made. The balconies with which the mediæval and later palaces of Venice are so abundantly provided are generally of Istrian stone or marble together with their parapets; those of the eighteenth century residences of France and Germany had generally the floor and supporting corbels of stone, but the parapets of wrought iron, in the design of which parapets a great variety of fanciful decoration is visible. The stone balcony projecting from the town hall in an Italian town is called Ringhiera (which see), that being the post from which the city authorities used to harangue the people. A balcony projecting into a church and connected with a doorway from an upper apartment or passage, such as is used for the singers at times of high mass, is called Cantoria (which see). Balconies projecting into dancing rooms or halls of reception and used for musicians are more often called musicians' galleries. — R. S.



Baldachin of S. Peter's Church (S. Pietro in Vaticano), Rome.

Designed by Bernini; of bronze; about 95 feet high (see cut of apse, S. Giorgio, Al Velabro.)

BALDACCHINO. Same as Baldachin; the original Italian form.

BALDACHIN; BALDAQUIN. *A.* A canopy made of a textile fabric (originally of baudekyn; a precious stuff brought from Baldacca or Bagdad), used in processions, placed over an episcopal chair and throne of state, or suspended over an altar where there is no ciborium.

B. A permanent canopy, especially above the high altar of a church; in this sense applied to the most massive and permanent structures, as the bronze baldachin in S. Peter's at Rome which is stated to be ninety-five feet high.

BALK. *A.* A heavy piece of timber, of any kind not in the log. A squared timber.

B. By extension from the above meaning, in primitive country houses of Great Britain, a loft formed by laying planks or poles on the balks or main timbers of the framing. Commonly in the plural.

BALKAN PENINSULA, ARCHITECTURE OF THE (excluding the kingdom of Greece). That of the modern states or provinces of Dalmatia and Bosnia, in the Austro-Hungarian Empire, Wallachia, and Moldavia, forming the modern kingdom of Roumania; the kingdom of Servia; the principalities of Montenegro and Bulgaria, and the Turkish provinces of Albania, Macedonia, Eastern Roumelia, and Thrace. Its chief topographical features are the valleys of the Save and Danube and the Balkan Range. Inhabited by diverse and often hostile races, its history has been one of constantly recurring wars and rebellions. Its architectural chronicles are as confused as its political, and, for the most part, even more barren of great achievements. Although it is classical soil, comprising the ancient provinces of Dalmatia, Illyricum, Pannonia, Mœsia, part of Dacia, and Macedonia, Thrace, and the Epirus, — the last three especially rich in historical sites, — its centuries of disorder and Turkish misrule and the universal treatment of its ancient monuments as quarries have combined to destroy the great works of antiquity, leaving only foundations and shattered fragments of their masonry. It must not be forgotten, however, that no thorough archæological research has yet been undertaken within its boundaries. Relics of antiquity abound throughout the peninsula, especially prehistoric walls of cyclopean construction, serving as foundations for Roman, Byzantine, mediæval, or Turkish fortresses, and preserving the lines of ancient towns and citadels. It is noteworthy that the villages of Bosnia to this day retain the plan of Greek towns with their citadels, walled *agoræ* with gates, and external or suburban streets of tombs. The best preserved and most important classic remains are the great theatre of Dodona (Dramisios) in the Epirus, exceeded in size by only two Greek theatres in Europe, — those at Sparta and Athens, — and by two or three in Asia Minor; a stadium six hundred feet long, and two theatres at Nicopolis (Prevesa); at Salonica, the ruinous triumphal Arch of Constantine (or Theodosius?), and the stupendous ruins of Diocletian's palace in Dalmatia where is now the town of Spalato. The Vardar gate or Arch of Marcus Aurelius at Salonica was demolished in 1869; the ruins of the unique Hippodrome Gate, called the "Incantada," formerly in the same city, were removed to the Louvre by Napoleon III. The palace of Diocletian, erected 303–305 A.D., near the ancient Salona, on the plan of a fortified camp, covers a rectangle of 520 by 630 feet, surrounded by a massive wall with sixteen towers and four gates admitting to the two chief intersecting avenues; and comprises within its area a temple, a domical mausoleum, now the Cathedral of Spalato, a basilica and numerous courts and halls. It is especially remarkable for the disregard of Roman traditions in its arcades borne directly on columns, its entablatures bent up around arches, like archivolts, and its details of mouldings and carving affording a foretaste of the Byzantine style. Roman aqueducts (one 30 miles long near Prevesa in Epirus), bridges (piers of Trajan's [Constantine's?] bridge at Turn Severin), forts, and towers, may be traced in ruins throughout the peninsula, or in substructions of mediæval or modern buildings.

From the fifth to the fourteenth century the Byzantine style prevailed throughout the whole region, except in Dalmatia, where it was early supplanted by the Italian Romanesque and Gothic. Most of its monuments, however, are of small size and internally adorned with frescoes instead of mosaic, and the monasteries which abound in the Epirus, Servia, Wallachia, and Macedonia rarely possess architectural interest, being in most cases wholly devoid of any pretention to artistic design (Meteora convent in the Epirus; Sveti Prochor in Servia; S. Naum in Macedonia; Rilo in Bulgaria; Nemoieshti in Roumania), except sometimes for their chapels. One of these, that at Kurté d'Arjish in Roumania, is of remarkable external beauty. Erected in 1514 by the Prince Negu Bessaraba in a style betraying Muscovite influence, it measures 90 by 50 feet, and consists of a square nave with a 16-foot cupola on a high drum, and a triapsal chancel with a dome of about the same size; two spirally fluted turrets adorn the front, and the whole exterior is richly decorated with wall arcades and panels.

The chief centre of architectural interest in this region is, of course, the city of Constantinople, whose monuments cover the whole period of its existence as a capital. Practically nothing remains of the period preceding its change of name under Constantine (330 A.D.) from Byzantium to Constantinople, except the substructions of the Hippodrome (at Meidan) and some scattered fragments of architecture and sculpture. The bronze serpent-column from Delphi and the Egyptian obelisk, in the Hippodrome, do not properly belong to the city's history. Of the early Byzantine period also but little has survived; the "Burnt Column" of Constantine, the shaft of Theodosius (fifth century), despoiled long ago of its gilded bronze covering, and the column of Marcian, are the most important objects. The great monuments of the mature Byzantine style, and of its decline, are briefly described in the article Byzantine Architecture. There are some fifteen or twenty Byzantine churches still extant, the greater part being used as mosques, and of small size. Among them may be mentioned, besides the great Hagia Sophia (532–538), S. Sergius (now Kutchuk Aya Sofia, 520 A.D.) the Church of the Holy Peace (Hagia Eirene or "S. Irene") of the sixth and eighth centuries, now used as an armory; the Kahrie Jami (mosque) originally the Church Moné tes Choras, of the tenth century, with fine mosaics; the S. John Studios basilica (Emir Akhor Jami); the *Theotokos* or S. Theodore, and the Pantokrator churches, both late; and two immense cisterns ("Yeré Batan Serai" and "Bin Bir Direk" or Thousand and One Columns) with domical vaults carried by countless superposed columns.

But the distinctive character of the aspect of the city is derived from its mosques, erected since the capture of the city by Mehmet II. in 1453. These number some hundreds, nearly all vaulted with domes on pendentives, and provided with from one to four slender minarets with tapering spires. Their domes, unlike the Persian and Indian, are of the Byzantine type with low curvature, each crowned with a crescent finial; and their outlines, rising from buildings of brilliant white — in many cases of marble — and contrasting with the taper minarets, produce a silhouette of extraordinary picturesqueness. Each of the larger mosques (Jami) is preceded by a large courtyard, surrounded by domed arcades, and many of them have as accessories tombs, schools, and hospitals. They are impressive, not by richness of detail, which is often meagre, but by their amplitude and loftiness, and by the noble scale of their parts. The chief among them are the Mehmediyé, by Mehmet II. (1453); the Suleimanyé (1553), by Suleiman I., the "Magnificent"; the Ahmediyé by Ahmet I. (1608), the only mosque with six minarets; the Yeni Jami (1665); the Nouri Osman (1755); and a number of smaller ones with rich interior veneering of tiles (*e.g.* Rustem Pasha). The more modern mosques show the degrading effect of late Italian influence in their vulgar detail and misuse of stucco; but the Shah Zadé is an exception, and some of those along the Bosphorus are picturesque objects. The same is true of the palaces and kiosques, mostly of late date and debased style, but not without bits of good design. A number of richly decorated marble fountains possess considerable architectural merit. There are no civic or private buildings of any real architectural importance.

Except in Constantinople, the most important group of Byzantine monuments is at Salonica (Thessalonica), the oldest of these being the Rotunda, or Church of S. George, a circular temple having internally seven niches and an apsidal chancel, with a dome richly decorated in mosaic. It dates probably from the time of Constantine, though possibly from that of Trajan. Hagia Sophia, now a mosque, measuring 140 by 113 feet, with a 33-foot dome, recalls its larger prototype at Constantinople, though of much later date. S. Bardias (Kazanjilar mosque), built in 987, the picturesque churches of S. Elias and of the Apostles (both mosques at present), and the small but elegant church of S. Pantelimon, all exemplify the later phases of Byzantine design with their small domes on high drums, and their picturesque use of brick and stone. Salonica also possesses two basilicas, the Eski Djuma, of unknown date, with three aisles and a gallery, and the larger five-aisled S. Demetrius, dating from 520 A.D. In the former are incorporated Ionic columns of a supposed Greek temple of Aphrodite.

The monasteries of Mt. Athos (Hagion Oros) on the Acte promontory, not far from Salonica, also deserve mention, not only as the most ancient monastic group in Europe, but also because Byzantine traditions are still preserved in their local art, frescoes of Scriptural subjects being still painted according to manuscript formulæ handed down from the eleventh century. The chapels of these monasteries, and the church of Karyes, the chief town of Acte, are worth a visit. Among other Byzantine edifices may be mentioned, in Roumania, at Jassy, the Church of the Three Saints; at Kimpolung, a monastery, fort, and river tower (1240); at Tismana, a monastery (1366), with a beautiful chapel; at Tirgovist, a church with rich carving; in Servia, at Kurshumlié, a small but elegant domical church, with a nave, now in ruins; at Studenitza, an interesting Byzantine church; at Skopia, in northern Macedonia, a Byzantine aqueduct; at Ochrida (Albania), the ruinous, but once beautiful, church of Hagia Sophia, and the cathedral, both ascribed popularly to Justinian, but probably of later date; at Goertcha, a richly frescoed church with a splendid altar of carved wood.

Dalmatia, though for a time a Byzantine province, belongs architecturally to Italy rather than to the Orient, and what few edifices betray the Byzantine style are of the ninth century, those of earlier date having been destroyed in the barbarian incursions of the seventh century. Among its circular and domical buildings are the Baptistery and S. Donato at Zara, S. Niccolo and S. Croce at Nona (cir. 810); S. Stefano and S. Giacomo in Peline at Ragusa. S. Lorenzo and S. Domenica at Zara, and S. Barbara at Trau are basilican churches, and S. Pietro Vecchio at Zara has a double nave. All these date from the ninth and tenth centuries, and are rude in execution, but their bold and vigorous design shows traces of Lombard and Italian Romanesque influences. These became dominant in the twelfth and thirteenth centuries, in a series of remarkable churches thoroughly Italian in character, and quite equal to contemporary Italian buildings. The campanile and the chapter house of S. Maria at Zara (1105) are Lombard in style; the nave of the Duomo at Cattaro (1123) is more Romanesque with its alternating clustered piers and single columns. The works of the thirteenth century display a more fully developed Romanesque style, earlier exemplified in the elegant east end of S. Grisogono at Zara (1175). To this period belong the nave of the Duomo at Trau (1213–1240), the campanile at Arbe, and the Cathedral of Arbe (1287). The Duomo at Zara is perhaps the finest of these works: its nave dates from 1250–1285; its façade (1324) is an especially admirable example of the style, with its wall arcades, its two wheel windows, and fine portal. These wheel windows are characteristic of the Dalmatian Romanesque, which makes good use also of arcaded cornices, wall arcades and arcaded galleries on the exterior, and of fantastic sculptured monsters and deeply recessed portals on its façades. The Duomo at Trau deserves especial notice for its fine east end and west portal. S. Maria Infunara at Cattaro (1220), called La Collegiata, and the tiny Church of S. Luca beside it retain a trace of Byzantine tradition in their pendentive domes over the central bay of their naves. The Italian Gothic is exemplified in the campanile and sacristy at Trau, a fine Gothic Franciscan cloister at Curzola, the imposing Pal. del Rettore at Ragusa (1435) and the cloister arcade of the Dominican convent at the same place, with rich late tracery, and in a number of buildings at Sebenico in the Venetian style. The Duomo at Sebenico (1430–1556), a three-aisled church without transepts, is remarkable for having no protective roof to the barrel vault of the nave: vault and roof are a single structure of stone. The octagonal dome and many details of this church belong to the early Renaissance. S. Chiara at Cattaro has a Renaissance façade with the inevitable wheel window: at Trau the Baptistery and Chapel of S. Ursini (1468), by A. Alexici of Durazzo, are in the style of the Renaissance, and so is the Loggia at Sebenico (1552). The Middle Renaissance is hardly represented in Dalmatia, except by the Porta di Terra Firma at Zara by Michele San Michele (1543); and the later works of the debased Jesuit style hardly deserve mention. The revived classic style spread into Servia in the seventeenth century, but it was carried by Italians who introduced the worst practices of the Decline, and its productions in Servia possess little or no beauty or interest.

Under Turkish dominion mosques were erected throughout the Balkan provinces, and their domes and minarets form to this day the most conspicuous features in the silhouette of the chief towns such as Serajevo in Bosnia, with one hundred and fifty mosques, Salonica, Adrianople, Sofia, Philippopolis, Rustchuk, Shumla, and even Bucharest (see Moslem Architecture). Among them all the Selimié mosque at Adrianople is preëminent, and is perhaps the crowning achievement of Turkish architecture. It was built by the great architect Sinan, during the reigns of Selim I. and Suleiman I. (cir. 1516–1550), and equals or surpasses the later mosque of Suleiman at Constantinople; its outline and masses are more symmetrical, its interior better composed and more richly decorated. Its great dome, 105 feet in diameter, rises in a very happy outline from an octagonal drum admirably composed with the masses of the surrounding half-domes below it, and of a remarkable series of buttresses disposed with an almost Gothic science and skill. The four fluted minarets with three galleries reached by separate concentric stairways, and the fine atrium with arcades carried on antique shafts of cipollino and verd antique, are worthy of special mention. The bazaar of Aali Pasha in the same city, a vaulted street nine hundred feet long, with six imposing gates; the mosques of Murad II. and Bayazid II. (1510), and the tomb of Mehmet I. (1422) are also worthy of mention; and there are many Turkish bazaars, khans, caravansarais, and aqueducts in the larger towns.

With the exception of the Legislative Palace at Bucharest and a few other public buildings in that city, the modern architecture of the Balkan peninsula is not worth noticing, even when it is not positively vulgar and ugly.

Curzon, *Visits to Monasteries in the Levant* (London, 1849); Franz Pasha, *Baukunst des Islam* (in the Darmstadt *Handbuch der Architektur*); *L'Architecture Ottomane*; Jackson, *Architecture of Dalmatia*; Leake, *Travels in Northern Greece*; Longfellow, *Cyclopædia of Architecture in Italy and the Levant*; Owen Jones, *Grammar of Ornament* (1856); *Ottomanische Baukunst* (1875); Parvillée, *Architecture et Décoration Turques au 15 Siècle* (Paris, 1874); Reid, *Turkey and the Turks* (1840); Tozer, *Researches in the Highlands of Turkey* (1869). See also Bibliography of Byzantine Architecture; Moslem Architecture.

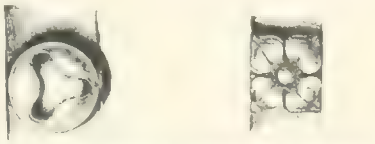
A. D. F. Hamlin.

BALL. An ornament of rounded form, common as the termination of a cupola or lantern. It is usually made of copper, and gilded. That of S. Paul's Cathedral is six feet in diameter. That of S. Peter's is about eight feet six inches in diameter.

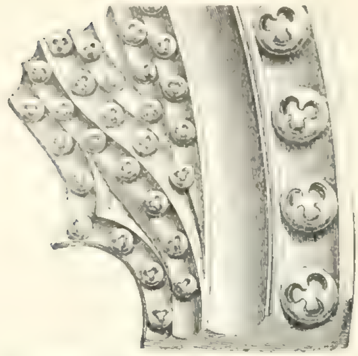
BALLAST. The filling of rough masonry required to give stability and weight to any construction, as above the haunches of light vaulting, also the rough broken stone or gravel used as such filling.

BALL COCK. A stopcock intended for supplying cisterns or tanks with water, and which is automatically opened or closed by the downward or upward motion of a floating ball. (See Ball Lever.) — W. P. G.

BALL FLOWER. A globular ornament frequently occurring in the hollow mouldings of English Gothic architecture. It suggests a flower with three, or rarely four, petals nearly closed over an inner ball, and is repeated at short intervals to give points of light in the darkness of the hollow. Isolated four-part ball flowers are sometimes found in late Norman work. (Cut, col. 195.)



Ball Flowers from Kingsthorpe Church, Northamptonshire; Late 13th Century.



Ball Flowers: Window Tracery of Gloucester Cathedral, 14th Century.

BALL LEVER. A brass or copper rod having a tinned copper ball float attached at one end, while the other end operates the ball cock, as in cisterns or tanks. As the water rises, the ball floats and moves the lever, which then shuts off the flow of water. — W. P. G.

BALLOON. *A*. The ball sometimes used as a terminal ornament to a cupola or lantern. (See Ball.)

B. A large ball, as of stone, used as an ornament; especially, one set high on the parapet of a building or porch, or on top of an isolated column.

BALLOON FRAMING. In the United States, a system of framing wooden buildings in which the corner posts and studs are continuous in one piece from sill to roof plate, the intermediate joists being carried by girts spiked to, or let into, the studs, the pieces being secured only by nailing, without the use of mortises and tenons, or the like. (See Wood, Construction in, Part II.)

BALLROOM. A large room or hall especially designed for balls and similar festivities. (See Assembly Room; Banquet Hall.)

BALLU, THÉODORE; architect; b. June 8, 1817; d. May 19, 1885.

Ballu was a pupil of Louis Hippolyte Lebas (see Lebas, L. H.) at the *École des Beaux Arts* from 1834 to 1840. In 1840 he won the *Grand prix de Rome*. His *envoi de Rome* was a remarkable restoration of the Erectheum at Athens. Returning to Paris, he was employed on many important public works, notably the completion of the Church of S. Clotilde, the restoration of the *Tour de S. Jacques de la Boucherie* (1854–1858), and the restoration of the Church of S. Germain l'Auxerrois (1858–1863). In 1860 he was made architect in chief of the fourth section of the public works of the city of Paris (religious edifices). Between 1861 and 1867 he built the Church of the Trinité with its presbytery. From 1871 to 1876 he was *inspecteur général* of the public works of the city of Paris. In 1874, with de Perthes, Ballu won the first prize in the competition for the new Hôtel-de-Ville (Paris), which they constructed.

Paul Sédille, *Notice Biographique* in *Revue Générale* (1886); Bauchal, *Dictionnaire*.

BALL VALVE. The supply cock of a cistern or tank which is controlled by a Ball Lever (which see). — W. P. G.

BALNEARIUM. A Latin term for a private bathroom; in the plural (*balnearia*), a range or series of such rooms.

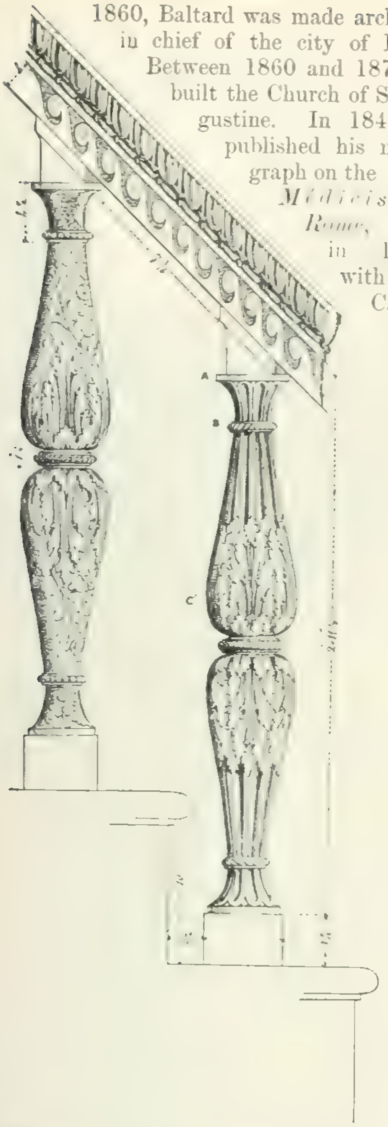
BALTARD, LOUIS PIERRE; architect, painter, and engraver; b. July 9, 1764; d. January 22, 1846.

Baltard was a pupil of A. F. Peyre (see Peyre) and Pique. Between 1788 and 1791 he studied in Rome. In 1792 he was made architect and designer of decorations at the Opéra (Paris). In 1793 he served as engineer with the army in Calvados (France). In 1796 he was appointed professor of architecture at the *École Polytechnique*, and was employed as engraver on the great work undertaken to illustrate Napoleon's Egyptian expedition. Baltard was architect of the Panthéon under the Empire, and between 1815 and 1818 served as supervising architect of the prisons and markets of Paris. (See Halles Centrales.) In 1818 he was made professor at the *École des Beaux Arts*, and from 1837 until his death was *inspecteur général* of the public works of the city of Paris. At Lyons (Rhône, France) Baltard built the Prison of the Quartier Perrache (1830), the Arsenal for Artillery (1840–1846), and other buildings of importance. He exhibited paintings in the *Salons* of 1810, 1812, and 1814. He published *La Colonne de la place Vendôme* (1810), *Recueil des Monuments antiques* (1801), *Grands Prix d'Architecture* (with Vaudoyer, 1818–1834).

César Daly, *Notice Nécrologique* in *Revue Générale*, Vol. VI.; Bauchal, *Dictionnaire*; Bellier de la Chavignerie, *Dictionnaire*; Gourlier, *Choix d'Édifices publics*.

BALTARD, VICTOR; architect; b. June 10, 1805; d. January 14, 1874.

A son of Louis Pierre Baltard (see Baltard, L. P.). He was educated at the Lycée Henri IV., and studied architecture and painting with his father and at the *École des Beaux Arts*, Paris. In 1833 he won the *Grand Prix de Rome*. In 1850 he was associated with Lassus (see Lassus) and Viollet-le-Duc (see Viollet-le-Duc) in the preservation of diocesan buildings. Between 1852 and 1859, with F. E. Callet (see Callet, père), he designed and built the great market (Halles Centrales) of the city of Paris. In 1853 he was made architect of the Hôtel de Ville, Paris. With Max Vauthier he designed and built the famous stairway of the *Cour d'Honneur* of this building, afterward destroyed (1871). March 30,



Baluster from the Pulpit Staircase, Siena Cathedral.

The stair is of 1543, much later than the pulpit

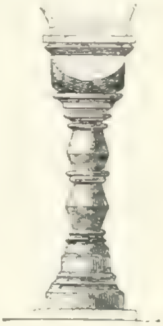
1860, Baltard was made architect in chief of the city of Paris. Between 1860 and 1871 he built the Church of S. Augustine. In 1847 he published his monograph on the *Villa Médicis à Rome*, and in 1863, with F. E. Callet, the *Monographie des halles centrales de Paris* (2d ed., folio, 1873).

Paul Sédille, *Victor Baltard* in *Gaz. des Beaux Arts*; A. Magne, *Notice Nécrologique* in *Revue Générale d'Architecture*, 1874; Vachon, *L'ancien Hôtel de Ville de Paris*; Bauchal, *Dictionnaire*.

BALUSTER. A short colonette usually complete with shaft, cap, and base, and used as one of many to support the hand rail or horizontal top member of a low screen or parapet (see Balustrade). The term is applied primarily to the classic and neoclassic instances, of which the typical form is that in which the shaft swells out decidedly near the bottom, producing a gourd-shaped or bottle-shaped form. There are, however, many varieties even of this; some having a square, some a polygonal, and some a circular horizontal section, while some are sculptured in all their parts. The term is equally applicable to the mediæval colonettes, such as those well known in the balconies in Venice and other northern Italian cities. In modern times the term is, by extension, applied to the similar member of wood or iron which forms one of the comparatively slight, vertical supports of a hand rail of the ordinary type. — R. S.

BALUSTER COLUMN. *A*. A column shaped somewhat like a baluster, with a short, massive, and strongly bellied shaft, such as occur not infrequently in the so-called Saxon architecture as supports in double-arched openings.

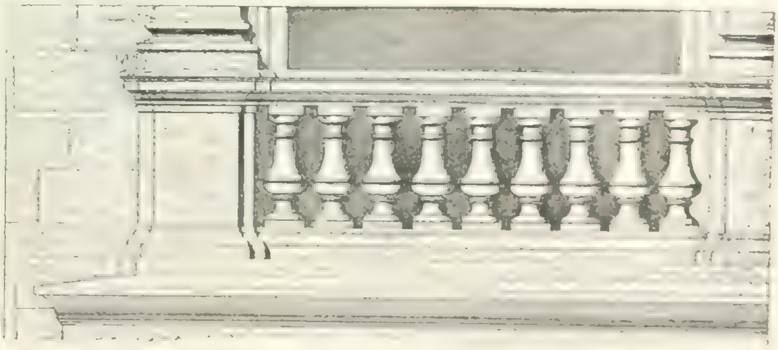
B. Any very short and thickset column in a subordinate position, as in the windows of early Italian campanili.



Baluster Column from S. Alban's Cathedral 11th or 12th Century.

BALUSTER SHAFT. The same as Baluster Column (which see), or, more specifically, the shaft of such a column.

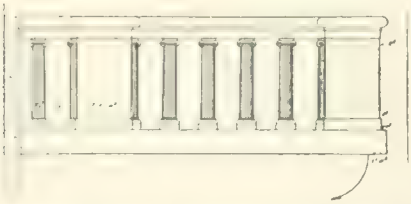
BALUSTRADE. *A*. A parapet or low screen composed of balusters carrying a rail or horizontal, usually heavy in proportion to the balusters themselves. The term is not often applied to any light structure, as of metal or of wood, but rather to a somewhat ponderous piece of stonework or its imitation.



Balustrade, forming Allège, its Hand Rail forming the Sill, from a Window in the Cour de Cassation, Paris.

B. By extension, and erroneously, any low parapet, although more usually one which is not a solid wall but is pierced with openings. Thus, a Gothic balustrade will often consist of a long and narrow strip of Tracery (which see) with cusped openings and with the top either horizontal or broken into the form of battlements. (See Parapet.) — R. S.

BALUSTRADE ORDER. An order of baluster columns; particularly the orders or systems of columns of short and massive proportions used in the Buddhist cave architecture of India, as at Aurungabad, Ellora, and other places.



Balustrade Order, forming the Parapet of the Palazzo Pitti, Florence.

BAMBINO. In Italian, a child or baby. Specifically, an effigy of the child Jesus, as displayed in the churches of Italy.

BANCO, NANNI D'ANTONIO. (See Nanni d'Antonio di Banco.)

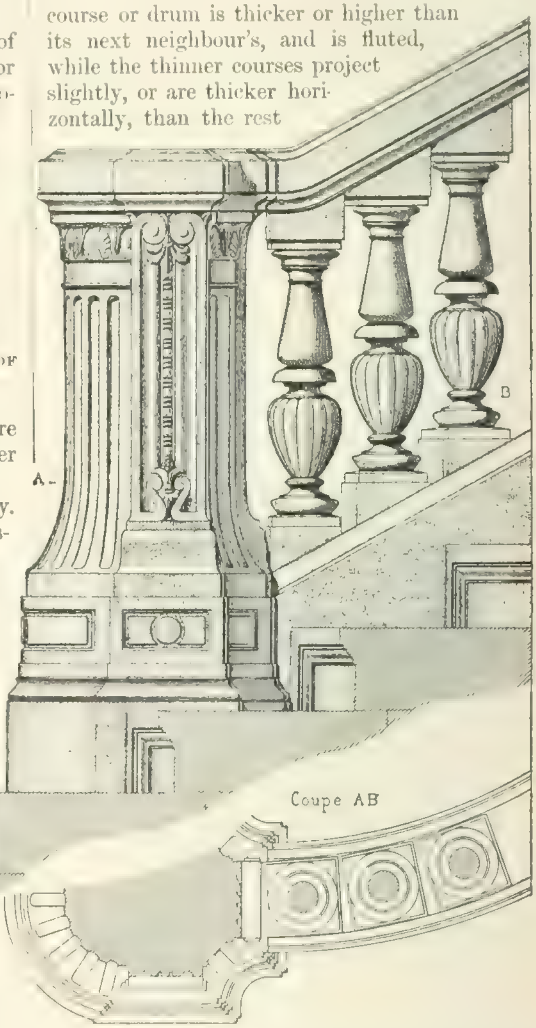
BAND. A flat member, usually horizontal or nearly so, decorating or serving to divide a wall when treated architecturally; or forming part of the ornamentation of a column in certain styles of architecture. The term is hardly used as an accurate architectural expression, but the special varieties of band are indicated by the terms string course, sill course, lintel course, frieze, plat band. (See also Banded Column; Entablature.)

BANDAGE. A band, ring, strap, or the like, generally of metal, placed around a structure to secure and hold its parts together; as around a tower or the springing of a dome.

BANDED. Provided with bands; bound at intervals with encircling bands or having bands as of a different material or a different colour.

BANDED ARCHITRAVE. In late neoclassic architecture in Italy, France, and England, an architrave (as to a door or window) interrupted at intervals by smooth projecting blocks, between which are set the moulded portions of the architrave.

BANDED COLUMN. In the architecture of the French Renaissance, a column built of drums alternately larger and smaller, of which the larger have the appearance of bands around the shaft; or built of drums alternately plainer and richer in decoration. The introduction of this feature is generally ascribed to Philibert de l'Orme. The earliest instance which is well known and can be accurately dated is that of the south front of the Louvre, the part called that of Henri II. In this, every alternate course or drum is thicker or higher than its next neighbour's, and is fluted, while the thinner courses project slightly, or are thicker horizontally, than the rest of the shaft, and are richly sculptured with emblems and the letter H. The same ornamentation is carried through the pilasters and the lines of it are carried along the wall. The term is equally applicable to a column decorated by one or more bands, carved or otherwise produced, about the shaft; as at the front of the Scuola di S. Rocco, Venice, where this feature is obviously introduced to decrease the apparent height of the shaft. The first sense, however, appears to be the only specific use of the term.



Balustrade of Stairs from a House in the Rue de Lisbonne, Paris, Work of the 19th Century.

BANDED PILASTER. A pilaster constructed or decorated in the manner described under Banded Column.

BANDEL, ERNST VON; sculptor; b. 1800; d. Sept. 25, 1876.

Bandel was educated at the Academy in Munich, and made several statues in that city. In 1834 he went to Berlin and later to Hanover, where he was employed on the Residenz (Royal Palace) until 1838. In 1875 he began the erection of the Hermann monument on the Grotenburg near Detmold, Germany.

Seubert, *Künstler-lexicon.*

BANDELET. *A.* A small flat moulding, larger than a fillet, less than a fascia or band.

B. A ring or small collar encircling a shaft: an annulet, as under the echinus of a Doric column.

BANDE NOIRE. In France, a number of persons supposed to have been associated as purchasers of the lands and buildings offered for sale by the revolutionary governments of 1791 and following years; or the whole number of such persons taken together. The term implies the mischief done by the destruction of precious monuments of art.

BANDEROLE. A sculptured band, as for bearing an inscription, or the like, especially when in the form of a ribbon or long scroll.

BANDLET. Same as Bandelet.

BANISTER. A baluster; a colloquial but improper and corrupted form. The term has, however, come to have the meaning only of a light and slender baluster, usually of wood, and forming part of an upright along the edges of well holes in houses, and along flights of stairs. In the plural, as The Banisters, it applies to the whole of such a light balustrade.

BANK. The place of business of an association, firm, or other organization which is doing banking business. Architecturally, the term is used loosely to cover Banking House, Banking Room, Bank Building.

BANK BUILDING. In the modern cities of Europe and America, a structure, often very large, built for a banking house and containing the rooms occupied by that business association, as well as, in very many cases, offices for rent to other firms or individuals. Some of the banking houses in the cities of the United States are of very great size and cost. One such, as in New York or Chicago, may contain several hundred offices for rent. A public institution such as that known as the Bank of England, the Bank of France, or the like, is generally housed in an important structure; some of those buildings are ancient palaces or mansions altered and perhaps enlarged to receive the bank, as is the case with the Bank of France (which see); while others have been especially planned for the purpose, as is the case with the Bank of England (which see). R. S.

BANKER. A bench on which stonecutters dress and prepare blocks of stone.

BANKING HOUSE. Same as Bank Building (which see). The term, as signifying also the business establishment or firm, may be considered as more properly limited to the building appropriated to the uses of a bank alone. Such buildings are still frequently erected in the smaller towns where space in the business quarter is not so precious as in the greater cities, and where the temptation is not so strong to utilize many upper stories for rent. Before the introduction of elevators such buildings were more numerous than at present.

BANKING ROOM. A room occupied by the clerks, tellers, etc., of a banking house, and to which access is given to the public for the purpose of depositing and withdrawing money, presenting notes for discount, and the like. The banking room of a large institution is often very decorative, lofty, and spacious, and richly adorned with architectural or other artistic dispositions. In some cases important mural paintings have been introduced, as is the case in the Bank of Pittsburg, in Pennsylvania.

BANKING UP. The process of piling earth or sand against the outer walls of a building to preserve the contents from the effect of cold or sudden storm. An Observatory (which see) in a high place, as upon a mountain top, is protected in this way for the sake of the instruments as well as for the resident astronomers and their assistants.

BANK OF ENGLAND. An important building in London, finished in 1734; the whole structure is one architectural story in height, and encloses several courts.

BANK OF FRANCE. A building in the heart of Paris, formerly the private palace called the Hôtel de Toulouse, but which has received many additions. One great room, the *galerie dorée*, designed by François Mansart, is splendidly decorated in the style of Louis XIV.

BANQUET HALL. A large room, hall, or apartment designed or used for festal or state functions; particularly one intended for dinners and banquets, as distinguished from *salons* and ballrooms. The term is not commonly applied to the great halls or galleries of English manor houses. It is nearly the equivalent of the *Salle des Fêtes* in French public buildings (e.g. the Hôtel de Ville, Paris) and châteaux. A famous example is that built by Henri II. on a bridge crossing the Cher, to form a wing to the Château at Chenonceau.

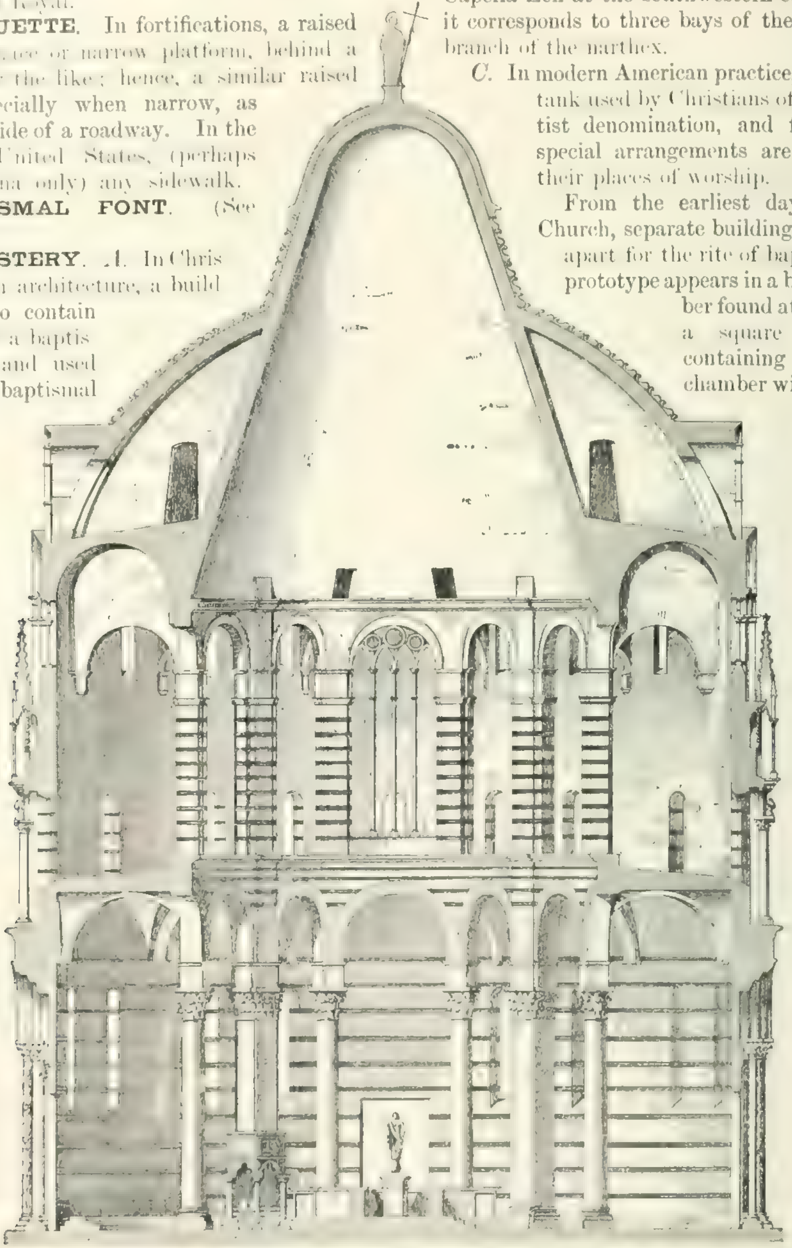
BANQUET HOUSE; BANQUETING HOUSE. *A.* A wing or annex to a palace, specially designed for state receptions and banquets, as at Hampton Court.

B. In particular, the structure at Westminster, London, erected from the plans of Inigo Jones (1619-1622) as a part of its design for a vast palace to replace the old Whitehall Palace. It was used at first as a Banqueting House, and then (until recently) as the Chapel Royal.

BANQUETTE. In fortifications, a raised standing place or narrow platform, behind a rampart or the like; hence, a similar raised walk, especially when narrow, as along the side of a roadway. In the southern United States, (perhaps in Louisiana only) any sidewalk.

BAPTISMAL FONT. (See Font.)

BAPTISTERY. *A.* In Christian church architecture, a building used to contain and shelter a baptismal font, and used chiefly for baptismal service.



Baptistery at Pisa; a Round Church of the 12th Century.

This vertical section shows a conical roof over the central part, which corresponds to the nave of an oblong church, and vaulted aisles two stories high. The curved outer cupola is a much later addition.

B. Part of a church especially reserved for baptismal service, as, in some modern buildings, the chamber under the tower or one arm of the transept, the western extremity of one aisle, or the like. The well-known baptistery of S. Mark's Church, at Venice, is a part of the narthex screened off for the purpose; it includes the whole southern part between the southern arm of the transept and the chapel called Capella Zen at the southwestern corner, and it corresponds to three bays of the northern branch of the narthex.

C. In modern American practice, the large tank used by Christians of the Baptist denomination, and for which special arrangements are made in their places of worship. — R. S.

From the earliest days of the Church, separate buildings were set apart for the rite of baptism. A prototype appears in a bath chamber found at Pompeii; a square building containing a round chamber with a semicircular niche in each corner of the square, and a round basin for bathing sunk in the floor. This arrangement, with some variations, is characteristic of the oldest baptisteries. None older than Constantine's time are known, and they were always much fewer than the churches, one being usually considered to be enough for a town. They were apart from the churches, but near their entrances, baptism being called figuratively by early writers the door of the Church. As early as the sixth century, a habit began of setting a font within the narthex, and later in the body of the church; by the eighth century, outside baptisteries began to fall into disuse. But in the large Italian cities independent baptisteries were built or rebuilt much later, being chapels or churches dedicated to S. John the Baptist, as we see in Florence, Pisa, Parma, and other cities. The usual form of baptisteries, built to cover a principal object, the font, which was naturally set in the middle, was round, or polygonal, or radiating from a centre. In the centre was the font, a large basin usually sunk in the floor, like those of the Roman baths, and railed in. In the oldest this was often surrounded by columns to which curtains were hung which could enclose the catechumen, who was stripped for immersion. The commonest form was octagonal, often an octagon rising out of a square. The oldest is probably that of S. John Lateran, apparently built with the adjoining basilica at the order of Constantine, though he was baptized elsewhere. It is an octagon some 68 feet across inside, with an aisle surrounding a central space enclosed by eight columns. These carry an upper order of columns with an entablature, and over this a modern drum and dome. They enclose the sunken basin, encircled by a balustrade, and holding in the centre an antique font of green basalt. Less important baptisteries were built without the outer aisle. It was common to wall them about with a square, filling up the angles with round niches, as in the Pompeian bath, and sometimes sinking square niches in the walls between. The octagon was then usually carried up into a clerestory and domed. We find this form at Ravenna, Novara, Parenzo, and Aquileia, and, farther east, in the baptistery attached to S. Sofia at Constantinople, and at Kalat Siman in Central Syria. The great baptistery of Nocera dei Pagani (Nocera, in the province of Salerno, Italy), now the Church of S. Maria Maggiore, is a rotunda of 70 feet inside, with an outer aisle and a central space surrounded by fifteen pairs of coupled columns, with the sunk basin in the middle under a canopy, the aisles vaulted, the middle domed. There are also square, hexagonal, and cruciform baptisteries. Most are ascribed to the first eight centuries — let us say the first ten. The large ones, which are baptismal churches, like those of Florence, Pisa, Pistoia, Parma, etc., were later, dating from the eleventh century to the thirteenth. That of Florence was the cathedral before it was the baptistery. There may have been many in Northern Europe, though the great ages of church building there were later than the time of building baptisteries, and naturally they were not adjuncts of monastic architecture. They are scarcely to be found now in Germany, England, or the North. In the south of France one remains, at Riez in Provence, which is typical — a square enclosing an octagon, with corner niches, and a central space surrounded by eight columns which bear a drum and dome. Another at Poitiers, called the Temple de S. Jean, is simply an oblong rectangle with a deep basin in the middle, of the peculiar Latin architecture which the French call the Gallo-Romain, but much disguised by later additions. — W. P. P. Longfellow.

For bibliography, see those under Latin Architecture, Romanesque Architecture, Italy, Germany; Isabelle, *Les Édifices Circulaires et les Dômes*; Gosset, *Les Coupoles d'Orient et d'Occident.*

BAPTISTERY OF THE ARIANS. At Ravenna; called more commonly Church of S. Maria in Cosmedin; an octagonal building of the fifth century.

BAPTISTERY OF CONSTANTINE. (Called also Baptistery of the Lateran and Church of S. Giovanni in Fonte.) In Rome, near the great Church of S. Giovanni in Laterano. Parts of the building date from the reign of Constantine (d. 337), but as now built it is mainly of the fifth century. It has been altered and restored at different times.

BAPTISTERY OF THE ORTHODOX. At Ravenna; an octagonal building of the fifth century.

BAR. A piece or member of any material whose length is much greater than its lateral dimensions, generally of the same cross-section throughout; hence, a structure consisting of such a member with its supports used as a barrier, railing, gate, or the like; hence, by extension, —

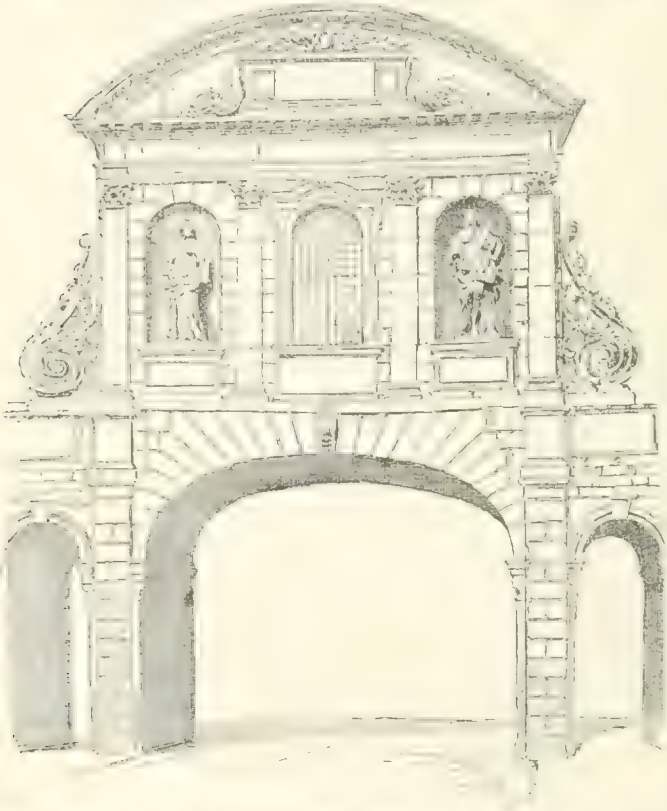
Bar of an Outer Door; Old House in Chelsea, Mass.

A. The structure at, or in connection with, such a bar or gateway, as the Temple Bar, formerly existing in London.

B. A counter or table in an eating house, or the like, over which refreshments are served, and acting as a barrier between the inmates and the public.

C. The space about or in front of a bar; the room containing a bar, in sense *B.* By extension, in England, the space behind the counter or bar, where is sometimes a fireplace and where the proprietor may have a small office and receive friends. — D. N. B. S.

Angle Bar. *A.* Same as Angle Iron.



Bar: Temple Bar: London, 1670. Designed by Sir Christopher Wren.

B. An upright bar, as a slender timber, at the angle formed by two faces of a polygonal structure.

Channel Bar. (See Channel Beam, under Beam.)

Eye Bar. A tension member, common in iron and steel trusses, having each end worked into the form of a small loop or eye, through which a pin secures the member to other parts.

I Bar. (See I Beam, under Beam.)

Swing Bar. A bar pivoted or hinged to serve as a gate or movable barrier, or, by falling into a socket, to operate as a fastener to doors or shutters.

T Bar. Same as T Iron.

Z Bar. A metal bar whose section approximates to the form of the letter Z; consisting of a web perpendicular to two flanges which it connects by their opposite edges.

BARABARA. An Alaskan house made of logs or whale ribs surrounded by sods, with the roof covered with sticks, dried grass, and sods. The grasses and flowers in the sods commonly continue to grow. A small window at the end, primitively glazed with seal intestine, furnishes light when the door is closed. A sod house.

In 1741, Bering found houses at Kyak Island made of logs and rough planks, roofed with bark and dried grass. The term "barabara" seems, however, to apply properly only to the sod, or semi-sod house.

—F. S. D.

BARAHDARI; BARAHDURRI. In India, a palace or castle, an elegant pavilion or place of resort; the term signifying, originally, a hall with twelve doorways. By extension, the term is taken to mean a mausoleum or tomb of great splendour.

BARBACAN. *A.* An outwork in mediæval fortification, as a gate tower; but more frequently an advanced work used to flank the approach to a gateway.

B. A movable structure used in an attack on a fortress.

C. A loophole for the discharge of missiles.

Written also Barbican.

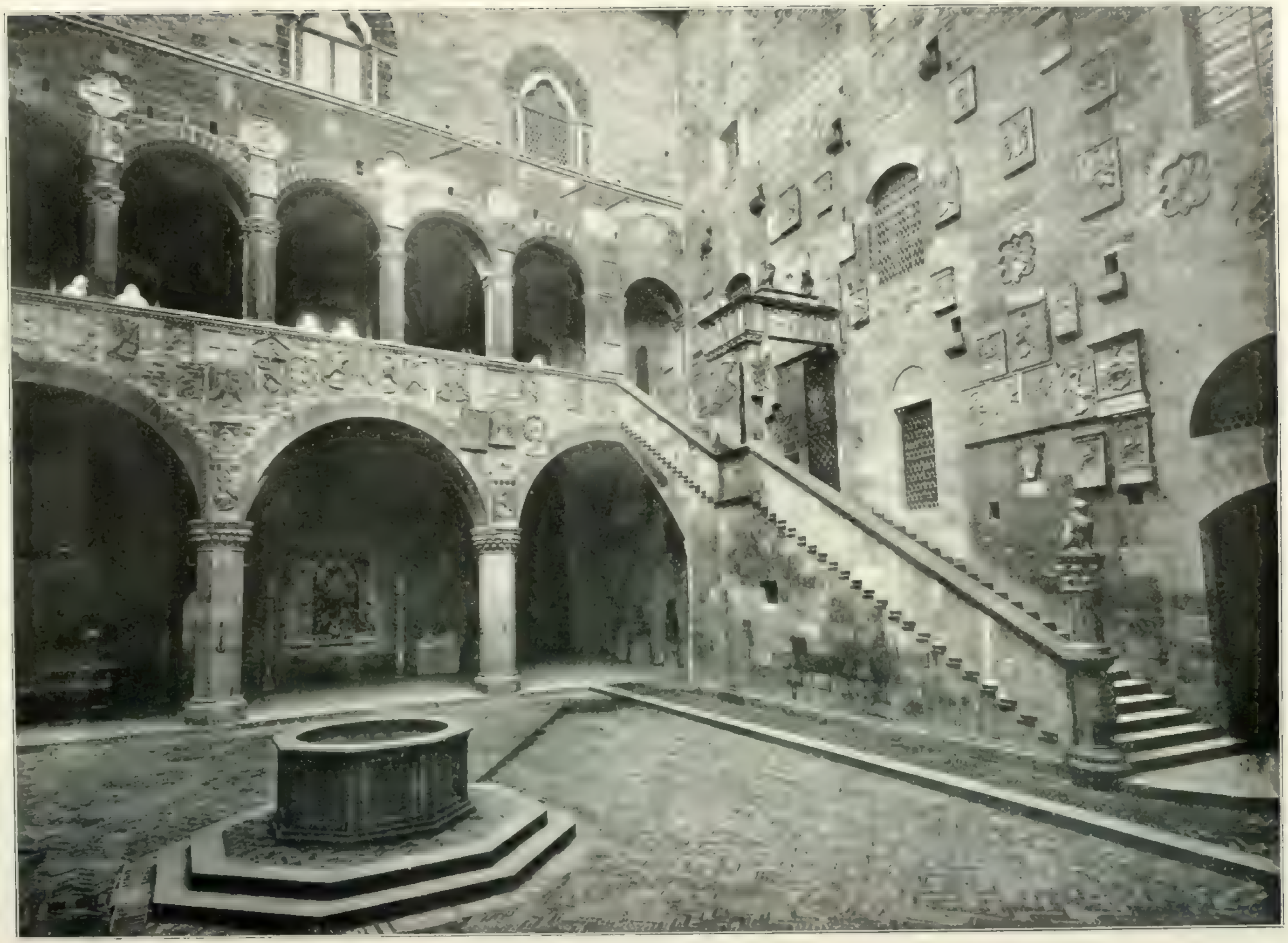
BARBARY STATES, ARCHITECTURE OF. (See North Africa, Architecture of.)

BARBICAN. (See Barbacan.)

BARCA, ARCHITECTURE OF. That of Northern Africa, west of and near Egypt, including the Pantapolis of Cyrene.

This has been little investigated; the few travellers who have published their impressions of the country have given but little attention to the buildings. The city of Cyrene, once the great centre of Greek civilization, and afterwards of singular importance under the Roman Empire, is still traceable in a vast number of ruins marking the city proper, and in a necropolis of unusual extent outside the ancient walls. The modern name is Grennah. Cyrene was only the first of five important cities, the others being Barca, Teucheira (afterward Arsinoë), Hesperides (afterward Berenice), and

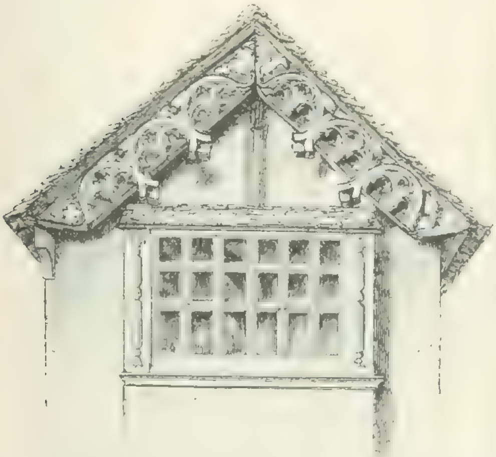
PLATE VI



BARGELLO

The court with external staircase to the upper gallery. The whole of this was built during the years from 1330 to 1345, the staircase with its curious gateway being the last of the details shown, except, of course, the carved armorial bearings of successive *podestàs* which are encrusted in the wall.

Apollonia, which was at first the port of Cyrene. Moreover, in the great oases, which lie surrounded by the desert at the south of the modern Turkish province of Barca, the few recent travellers have discovered important Roman remains. It is altogether probable that an archæological expedition, with means sufficient to allow of several years' continuous research, would add immensely to our knowledge of Greek and Greco-Roman art. (See North Africa, Architecture of.) — R. S.


Bargeboard at Shrewsbury, Shropshire; about 1350 (the Window is Later)

B. ARCH. The abbreviation used in some colleges for the degree of Bachelor of Architecture.

BARDI, DONATO. (See Donatello.)

BARDIGLIO. Same as Bardiglio Marble, under Marble.

BARE. In roofing or siding, that part of a slate, shingle, or roof tile which lies exposed to the weather. The bare and the cover comprise between them the whole surface of the slate, shingle, or the like.

BAREFOOT (adj.). Set upon and secured without a mortise and tenon, or the like; said of a post or stud in a Balloon Frame (which see). (U. S.)

BARGEBOARD. A piece of board hung from the edge of a gable roof where it projects beyond the gable wall, and either covering one of the rafters of the bargecouple or taking its place. The two bargeboards usually meet at the ridge of the roof and extend, one on either side, to the eave. They are often made ornamental, carved or pierced with patterns, and, especially in English work, form an important part of the decorative treatment of the building.

BARGECOUPLE. One of the pair of rafters which carry that part of a gable roof which projects beyond the gable wall. These rafters must be carried by projecting horizontal timbers, and these timbers may be the roof plates, the ridgepole, and the purlines, or they may be separate pieces projecting horizontally and supported from beneath by brackets. The two rafters of the couple-close may be chamfered, carved, or the like, as is often done in German wooden buildings, or they may be concealed by the bargeboards.

BARGECOURSE. *A.* The range of tiles or slates along the sloping edges of a gable roof; they usually project slightly over the bargeboards.

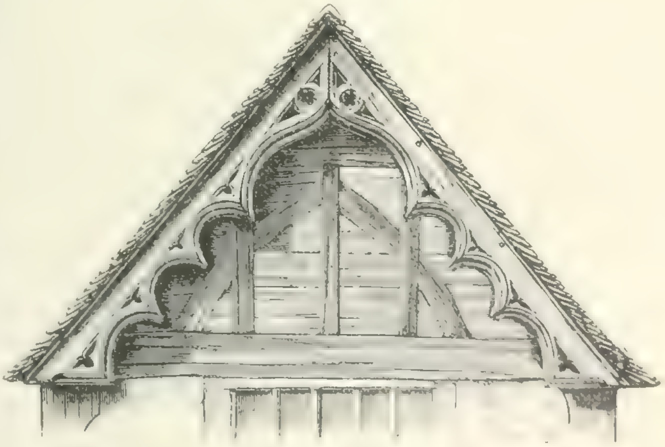
B. The whole projection of a gabled roof beyond the gable wall. In Swiss châlets this projection is sometimes very great, 6 feet or more, and may cover and shelter one or more galleries or verandas projecting from the walls below.

C. A course of bricks forming the coping of a wall, set on edge and transversely.

BARGELLO. Any Italian building used as the headquarters of a watch or armed police; especially, in Florence, the ancient palace of the *podestà*, and considered as the centre of the armed force of the town. It was built in the fourteenth century in an interesting and unique Florentine style, with segmental arches on the court, of which style its great court is the most valuable specimen.

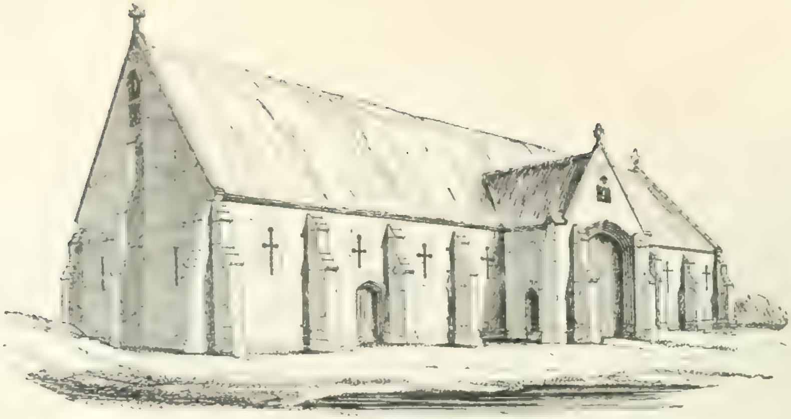
BARGESTONE. One of several stones which form the sloping top of a gable built of masonry. (See Boltel; Coping; Gable.)

BARILE, ANTONIO; woodworker (*intarsiatore*); b. 1453; d. 1516.

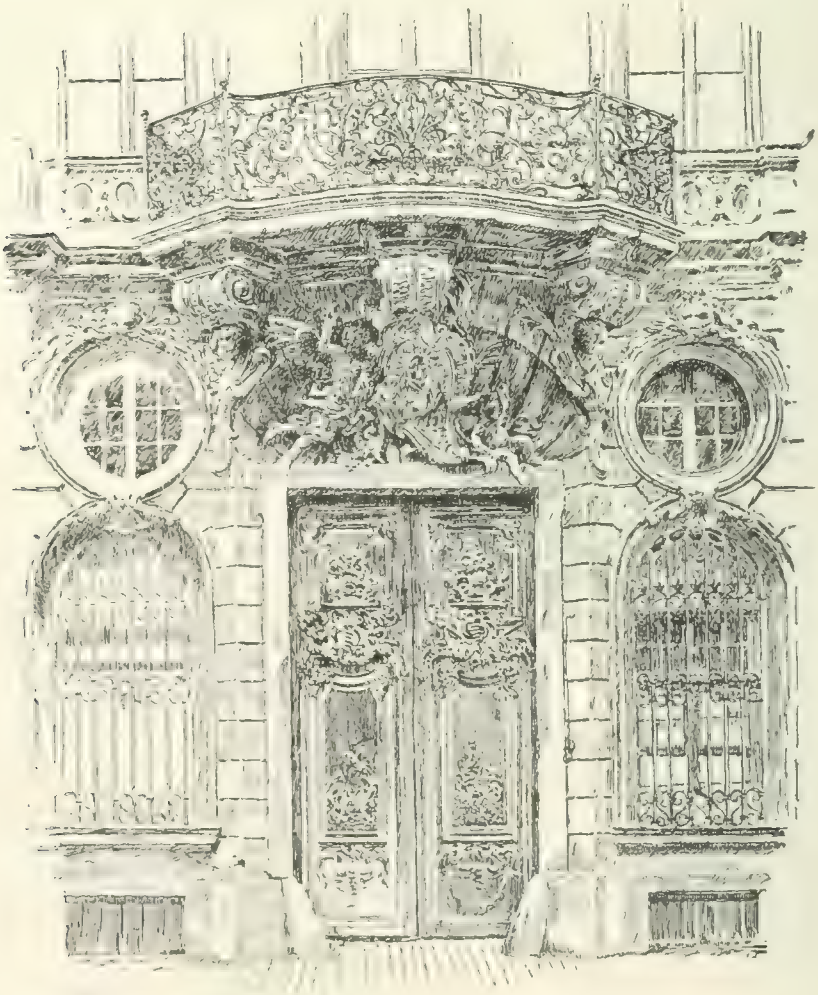

Bargeboard, Late 14th Century, Wingham, Kent, England

Antonio and his nephew, Giovanni Barile (see Barile, G.), were employed in the decoration of the palace of the tyrant Pandolfo Petrucci at Siena, Italy. He did much carved and inlaid work at the Cathedral of Siena.

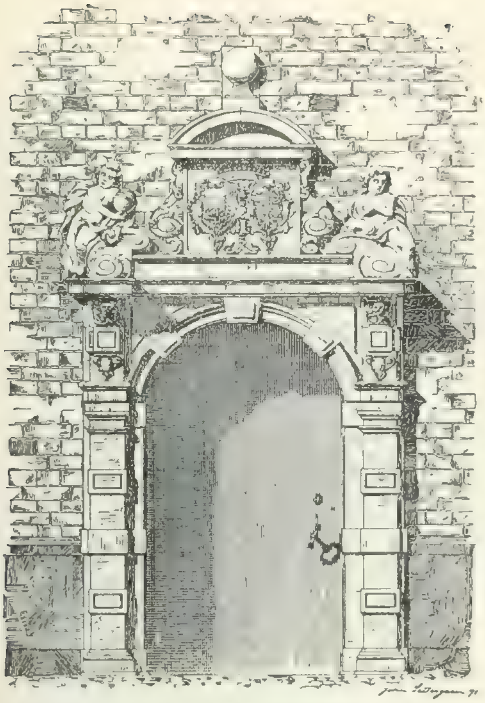
Müntz, *Renaissance*.



Barn: Stone Barn of the Monastery, Pilton, Somersetshire.


Otto H. Bacher, 96.

Barocco (German, Barock) Architecture: Street Front in Munich; about 1760.



Barocco Architecture: Doorway of Church on the Estate of Tyreso, Sweden.

BARILE, GIOVANNI; woodworker (*intarsiatore*); d. 1529.

Giovanni was a nephew of Antonio Barile (see Barile, A.). He assisted his uncle in the decoration of the palace of Pandolfo Petrucci in Siena, and made the doors of Raphael's Stanze in the Vatican. He carved the frame of Raphael's "Transfiguration." Nov. 1, 1514, he was commissioned to make a wooden model of S. Peter's according to Raphael's design.

Müntz, *Renaissance;* Letarouilly, *Vatican.*

BARK HUT. A decorative summer-house of the "rustic" kind, covered with small logs, whole or split, with the bark still in place; or else with strips of bark nailed directly to the siding.

BAR LIFT. A lift for a heavy window sash, consisting of a stout bar, usually about 20 inches long, held horizontally at the distance of an inch or more from a plate or plates screwed to the sash.

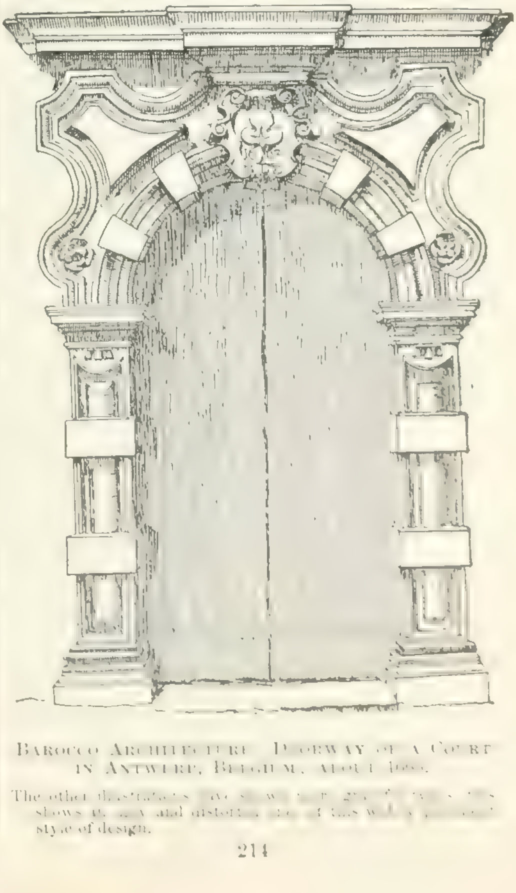
BARN. A building used for the storage of hay, grain, or the like; usually one of the buildings of a farm. In the United States, the term is constantly extended to cover the stable for horses or cattle, or both, as it is more usual to build a single large building for all these purposes. (Cut, cols. 211, 212.)

BARN RAISING. (See Raising.)

BAROCCO (adj.). Irregular; informal; unexpected; not according to the traditions of the schools. The term seems to be the Italian form of an original Spanish or Portuguese word, the French form of which is *baroque.* According to the tastes and opinions of the person who used it, the term is either one of reproach, or a mere qualification descriptive of the decorative art of a certain period.

BAROCCO ARCHITECTURE. That which is assumed to have the characteristics included in the term "barocco." It is a mistaken use of the term to treat it as synonymous with rococo, or to apply it with any accuracy to a period or style. English writers are sometimes influenced by the example of the Germans, who use the equivalent term *Barock* for the Italian architecture following the Renaissance, or roughly from 1550 nearly to the French Revolution, and thus overlapping and including the style which they call *rokoko.* The Italian writers, using all such qualifications with much greater subtlety of meaning, always imply by this term a certain decadence in taste; and they have introduced a verb *imbarocchire,* meaning to pass into vulgarity, or at least into tasteless abandonment of the traditions. (See Classicismo; Decadence; Decadenza; Neoclassic; Renaissance; Rococo.) (Cut, cols. 211, 212.) — R. S.

BAROQUE. An irregular pearl; one which is so far from spherical in its shape that it is used by jewellers rather for some piece of imita-



Barocco Architecture: Doorway of a Court in Antwerp, Belgium, About [illegible].

The other illustrations [illegible] shows the [illegible] and distorted [illegible] of this [illegible] style of design.

[illegible], so as to form the body of a bird, or the like, than in the usual way of employing pearls.

BAROQUE (adj.). *A.* Same as Rococo; used in this sense by many French writers and by English writers who follow them.

B. Same as Barocco. In this sense it is rather as a term of reproach that the adjective "baroque" is applied to architecture. It is used in this way without very exact meaning, characterizing rather the late neoclassic architecture as of the middle of the seventeenth century; but applied also to the Jesuit style, and even to the Italian architecture of Bernini and Carlo Maderno; and in general for anything assumed to be excessive, extravagant, and in bad taste.

BAROZZIO, GIACINTO (JACINTO, HYACINTH); architect.

The son of Vignola (see Barozzio, G.). He assisted Ignatio Danti in editing *Le due Regole della Prospettiva Pratica* of Vignola, in 1583, and superintended the construction of many of his father's architectural undertakings, notably the ducal palace of Piacenza.

Arch. Pub. Soc. Dict.

BAROZZIO, GIACOMO (called **VIGNOLA**); Italian architect; b. Oct. 1, 1507; d. July 7, 1573.

Giacomo was the oldest son of one Clemente Barozzio of Milan, who, forced to leave that city by political disturbances, settled at the village of Vignola near Modena, Italy. He went to Bologna to study painting, and later turned his attention to architecture. About 1535 he went to Rome. Vignola was commissioned by Primaticcio (see Primaticcio), who visited Rome in 1539–1540, to superintend the casting of antique statues for Francois I. of France. A visit to France about this time was not productive of any important results. Returning to Rome, he was charged by the Vitruvian Academy, which was founded in 1542 by Marcellus Cervinus (afterward Pope for twenty-one days as Marcellus II.), Bernardino Maffei (afterward cardinal), Alessandro Manzuola, and others, including probably Michelangelo, with the investigation and measurement of the Roman monuments. He was about this time much occupied with important works at Bologna. Gaye publishes a long letter from Vignola to the officials of the Church of S. Petronio at Bologna defending the design which he had made for the façade of that church. (The façade was never built.) He made the canal at Bologna at this time, and designed the fine Palazzo Isolani at Minerbio (now destroyed). The famous Portico dei Banchi at Bologna was built by him later, in the pontificate of Pius IV. (Pope 1559–1565). Vignola was made chief architect of Julius III. (Pope 1550–1555) and directed the reconstruction of the aqueduct called Aqua Virgo at Rome (built 48 B.C.). He also built at the Villa di Papa Giulio at Rome the larger casino with the semicircular colonnade. For Alessandro Farnese, second cardinal of that name, he built the great pentagonal palace of Caprarola, seven miles southeast of Viterbo, Italy (begun 1547, finished 1559), the famous church at Rome called del Gesù, and laid out the Farnese gardens on the Palatine Hill. The fine gateway which he built for these gardens was removed for the recent excavations in the Forum. For Ottavio Farnese (1520–1585) Vignola planned the ducal palace of Piacenza, now nearly destroyed. He is supposed to have been employed by Michelangelo Buonarroti (see Buonarroti), and some of the characteristics of that artist's work as architect are ascribed to Vignola. Charles Garnier (op. cit.) ascribes the cornice of the Farnese Palace to Vignola. He built the Porta del Popolo in Rome. In 1564 he succeeded Michelangelo as architect of S. Peter's. He composed two books: the *Regola delli cinque ordini d'architettura* (1563), still the standard text-book of the French schools, and *Le due Regole della Prospettiva Pratica*, published by Ignatio Danti after his death in 1583. Vignola had a large professional practice. A partial list of his buildings is published in the Architectural Publication Society's Dictionary. The *Œuvres complets de Vignole*, ed. Lebas and Debret, was published in Paris in 1815.

Muntz, *Renaissance*; Ronchini, *I due Vignole*; Ignatio Danti, *Vita di Jacopo Barozzi da Vignola*; Enrico Maccari, *Il Palazzo di Caprarola*; Milizia, *Memorie*; Charles Garnier, *Michel-Ange, architecte*; Gaye, *Carteggio*.

BAR PARLOUR. Same as Bar, *C.*

BARRACK; BARRACKS. [The term more properly treated as a plural noun (like thermae) and as such a little difficult to use in an ordinary sentence. The term "barracks" is, however, very common, especially as in definition *C.*] *A.* A plain and coarse building, especially if large; thus, although a hut or small cabin has been called by this term, it seems to be in more general use as applied to a large structure or a row of houses joined together. The term seems to carry with it also the idea of residence. Thus, a row of houses erected for the workmen on a newly opened mine or proposed fortress, or the like, is commonly called a barrack, both in England and America.

B. A building erected for the permanent lodgement of soldiers. In this sense exactly equivalent to the French Caserne (which see).

C. A roof of thatch or similar inexpensive material loosely fitted at its four corners to four poles so that it is adjustable at a higher or lower level; generally by pins in auger holes. This is intended for shelter for hay, which in America is commonly laid up within the square formed by such poles and used from the top, the roof being lowered as the hay is removed.

This practice seems to be peculiarly American, as in England the carefully made haystack is used, the hay being cut from it, in what is called a truss, by means of a knife specially made for the purpose. — R. S.

BARRACK ROOM. *A.* A room in a Barrack, or used for purposes of a barrack.

B. In the eighteenth century, that room in large country houses in which many beds were kept for the use of unexpected guests.

BARRACOA. A grain house of the northwest coast American Indians. It is built above ground on four posts about 15 feet long.

— F. S. D.

BARRE, ELOY DE LA; architect; b. Aug. 17, 1764; d. May 20, 1833.

De la Barre was a pupil of J. D. Antoine (see Antoine) and François Chalgrin (see Chalgrin). In 1813 he succeeded Alexandre Brongniart (see Brongniart) as architect of the Bourse in Paris. He finished this building, of which the foundations only had been laid.

Lance, *Dictionnaire*; Bauchal, *Dictionnaire*.

BARRICADE. Originally, a barrier, screen, or wooden wall, stout and useful as protection; the term being derived from bar, as Palisade (which see) is from pale. By extension, and in imitation of French usage, a Rampart (which see) hastily made of the material most readily at hand. The term has no strictly architectural sense.

BARRIER. A wall or unroofed enclosure of bars or posts intended as a protection, or as a separation between parts of a town or of a room, of wood or iron, or of a permanent material. Barriers may be as small as the low railings used in theatres to keep the crowd in line while waiting for the purchase or giving up of their tickets, and they may be high, strong, permanent and rudely ornamented. In Paris, before the completion of the fortification in the reign of Louis Philippe (since which time the *mur d'enceinte* has served the purpose) there was a barrier where each important street crossed the line of the *octroi* or limit within which goods had to pay for their entrance. The French term in this case (*barrière*) corresponds exactly with the English one in significance. (See Bar.)

— R. S.

BARROOM. In the United States, a room fitted with a bar for drinkers. This bar is the only necessary appendage; but in an establishment of any pretensions there are small tables and chairs for persons who propose to make some stay conversing together, etc. The term is, therefore, nearly equivalent to the English use of the word Bar (which see). In the towns of the United States there has been since about 1880 some attempt to substitute the word Café, but perhaps only where there are tables, etc., as above.

BARROW. A mound of earth usually considered as a sepulchral erection and to have been heaped above the stone coffin or the larger tomb of a chief. The term may be considered as synonymous with Grave mound and Tumulus (which see). The barrow is of many shapes, as nearly circular, oval, etc., but no safe classification based upon form and appearance has been made. There are, however, one or two peculiar forms, as the Twin Barrow, so called, which consists merely of two mounds near together, and often enclosed by one ditch or sinking in the surface, and the Bowl Barrow, which has a raised rim and a sinkage within it. The Chamber Barrow is nothing more than a mound in which the stone chambered tomb has been found still in existence. The term "barrow" has been extended to remains which are evidently of totally different character; thus, the term "pond barrow" has been given to what is evidently the trace of a primitive building of some kind, most often a dwelling house. Some very large mounds, such as Silbury Hill near Marlborough, in Wiltshire, England, are admitted to be not grave mounds, and, therefore, not in strict sense barrows, but rather raised platforms upon which special sacrifices could be performed. (Compare Teocalli. See also Cairn; Cist; Cromlech; Dolmen; Moathill.)

— R. S.

BARROW HOLE. An irregular hole left temporarily in the wall of an unfinished building to admit the workmen with their wheelbarrows or handbarrows.

BARRY, SIR CHARLES, R. A.; architect; b. May 23, 1795; d. May 12, 1860.

Barry was articled to Middleton and Bailey, surveyors, at Lambeth, London. He exhibited his first drawing, a "View of the Interior of Westminster Hall," at the Academy in 1812. In 1817 he visited Italy, and in 1818, Greece, Palestine, and Egypt. Barry built the Sussex County Hospital and the Manchester Royal Institution. In 1832 he completed the Travellers' Club in London, one of his most successful buildings. S. Stephen's Chapel (Westminster, London), which had been used for the sittings of the Houses of Parliament, was destroyed by fire Oct. 16, 1834. July 17, 1835, a royal commission was appointed to select a site and designs for a new building. Barry entered the competition. His designs were accepted Feb. 29, 1836. He laid the first stone of the new building of the Houses of Parliament April 27, 1840. That portion which was intended for the House of Lords was completed in time for the session of 1847, and the House of Commons for the session of 1852. In 1837 Barry won the competition for the building of the Reform Club, London. In 1840 he made additions to University College, Oxford. Barry was elected associate of the Royal Academy in 1840, a Royal Academician in 1844, and knighted in 1852. He was a Fellow of the Royal Society, a member of of the Royal Institute of British Architects, and won the gold medal of the Institute in 1850. He published *Illustrations of the new Palace of Westminster*, one vol. fol., London, 1849, and *The Travellers' Club House*, one vol. fol., London, 1839.

Alfred Barry, *Memoirs of Sir Charles Barry;* [illegible], *Notice sur la vie et les œuvres de Sir Charles Barry;* Digby Wyatt, *The Architectural Career of Sir Charles Barry*, in R. I. B. A. Transactions, 1860.

BARTH, WILHELM; sculptor and architect.

Barth made a fine stone fireplace in the *Sommerrathsstube* in the *Rechstädtisches Rathhaus* in Danzig, Prussia. It was painted and gilded by Hans Vredeman de Vries. (See Vredeman de Vries.)

Schultz, *Danzig und Seine Bauwerke.*

BARTIZAN. In Sir Walter Scott's writings, a turret or balcony carried on corbelling or arches and projecting from the walls of a building. The term seems to be a reminiscence of the old English bretising or some such misspelling of the word Brattice or Bratticing. Writers copying the term from Scott use it as equivalent to machicolation.

BARTOLOMMEO DEL CAPRINO. (See Meo del Caprino.)

BASALT. A volcanic rock lava, consisting essentially of augite and a soda lime feldspar with usually olivine. Usually of a dark gray, sometimes almost black, colour, and highly vesicular. — G. P. M.

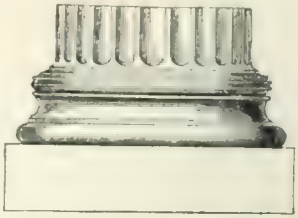
BASCULE. A mechanical apparatus acting on the principle of a balanced or counterpoised lever; especially one serving for the lifting of a Bascule Bridge (which see under Bridge); common in mediæval military architecture.

BASE. The lowest part or the lowest main division of anything, as of a column, pier, the front of a building or of a pavilion, tower, or the like. (For its general meaning, compare Base Block; Base Course; Basement.)

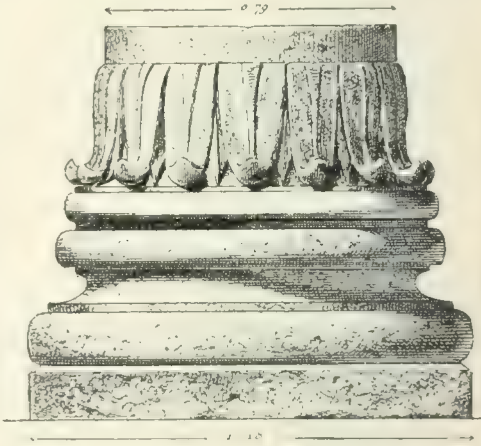
Base of Egyptian Column in the Ruins of Thebes.

The term is used independently in the following senses: —

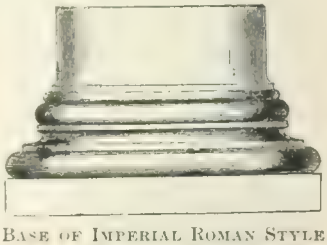
A. The lowest of the three principal parts of a column, when the column is so divided. Many Egyptian columns and the columns of the Grecian Doric order have no bases; moreover, in other styles many pillars, which, from their approximately cylindrical form are called columns, have no base in the strict sense here given to the term. The traditional base of the Ionic columns of one of the porches of the Erechtheum in Athens is made up of, first, a group of hollow mouldings divided by narrow fillets, below this a larger cove between two fillets, and below this a convex moulding almost semicylindrical in section, called generally a Torus (which see). The Attic base, so called, consists of the following members, beginning at the top: a convex moulding of nearly semicylindrical section; a scotia between two fillets; another convex moulding somewhat larger than the upper one. The base of the mediæval columns, Eastern and Western, Byzantine, Romanesque, and Gothic, are extraordinarily varied, and it is evident that the artist tried very many combinations of mouldings, retaining for frequent use only those which were the most agreeable to the eye and expressive of the function of the base, which is, of course, to extend somewhat the area of pressure. As the use of the square plinth below the base had been adopted from Roman practice, and had become very common, the mediæval builders adopted a spur to fill each of the four corners of this plinth and to extend still



Base of Ionic Order: the Erechtheum, Athens.

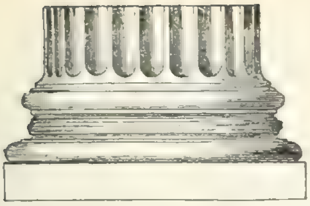


Base of Late Greek Work in Syria: Temple at Soueideh.

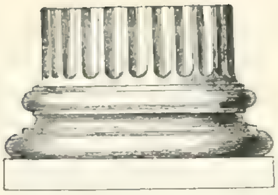


Base of Imperial Roman Style from the Aqueduct of Hadrian.

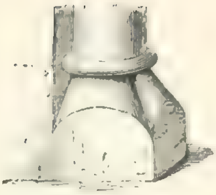
Compare with cut, Attic Base.



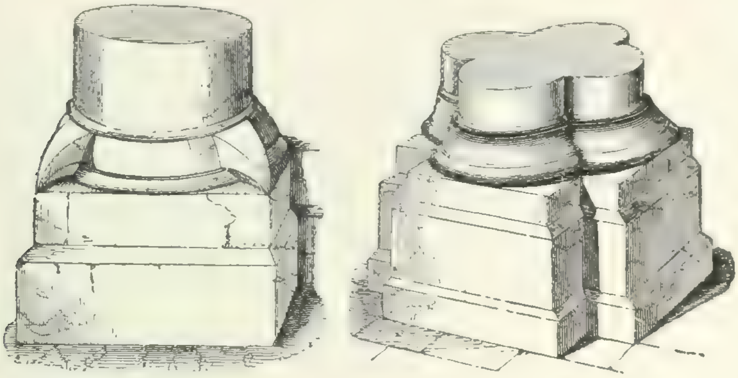
Base of Corinthian Order from the Temple of Castor, Rome.



Attic Base: Base of Corinthian Order, of the Pattern prescribed by Vitruvius, and called by him Attic Base.

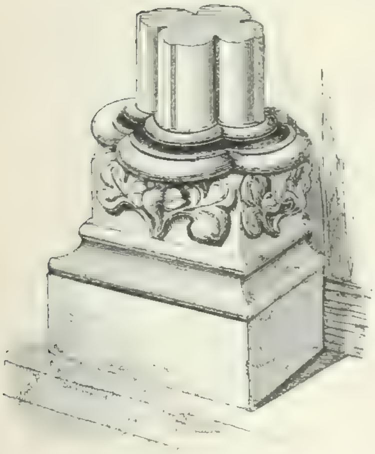


Base of a Wall Pier, or Engaged Column; Haddiscoe Church, Norfolkshire.

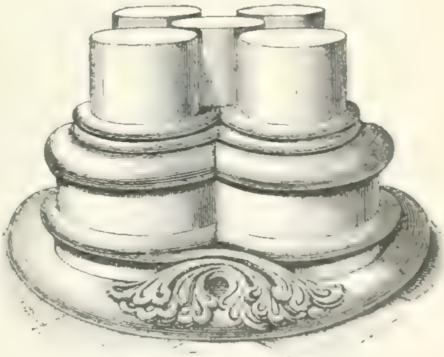


Bases at S. Peter's, Northamptonshire; Late 12th Century.

Base with spurs or griffes of a round column ; Base of a clustered pier of quatrefoil section.



Base of Clustered Pier with Rich Sculpture (an Unusual Decoration): Chapter House, Lincoln Cathedral; about 1200.



Base of Clustered Pier, Salisbury Cathedral; about 1250.

Base from Bernini's Colonnade, Piazza di San Pietro, Rome; A.D. 1667.

[illegible] the projection of the base upon the plinth.

B. The lowest part of a wall or pier, especially if ornamented by mouldings or by a projecting feature decorated by panelling or sculpture. In this sense the term is incapable of accurate and exhaustive definition, as the lowermost course of stone in the exterior of a wall, where it shows above the pavement or the surface of the ground, is capable of an infinite variety of artistic treatments. Hence, —

C. A member of any material applied as a finish or protection at the foot of a wall, or the like, especially in interior finish, as a baseboard forming part of the wooden trim of a room. (See Skirting.) (Cuts, cols. 221, 222.)

Attic Base. In Greco-Roman architecture and its imitations, a base consisting of an upper and a lower torus between which are a scotia and two narrow fillets, as described in the article Base (which see). Vitruvius (III., 3) says that it will be in height one third of the thickness of the column; that of this height the upper torus will form one quarter (or one twelfth the diameter of the column), the lower torus, one half of the remainder (or one eighth of the diameter), and the scotia, with its fillets, an equal amount. (Cut, cols. 221, 222.)

BASE BLOCK. A block of any material, generally with little or no ornament, forming the lowest member of a base, or itself fulfilling the functions of a base; specifically, a member sometimes applied to the foot of a door or window trim, corresponding in position to Base, *C* (which see).

BASE BOARD. In carpentry, a wooden base in the sense of Base, *C* (which see).

BASE COURSE. The lowest course of masonry of a wall or pier; the footing.

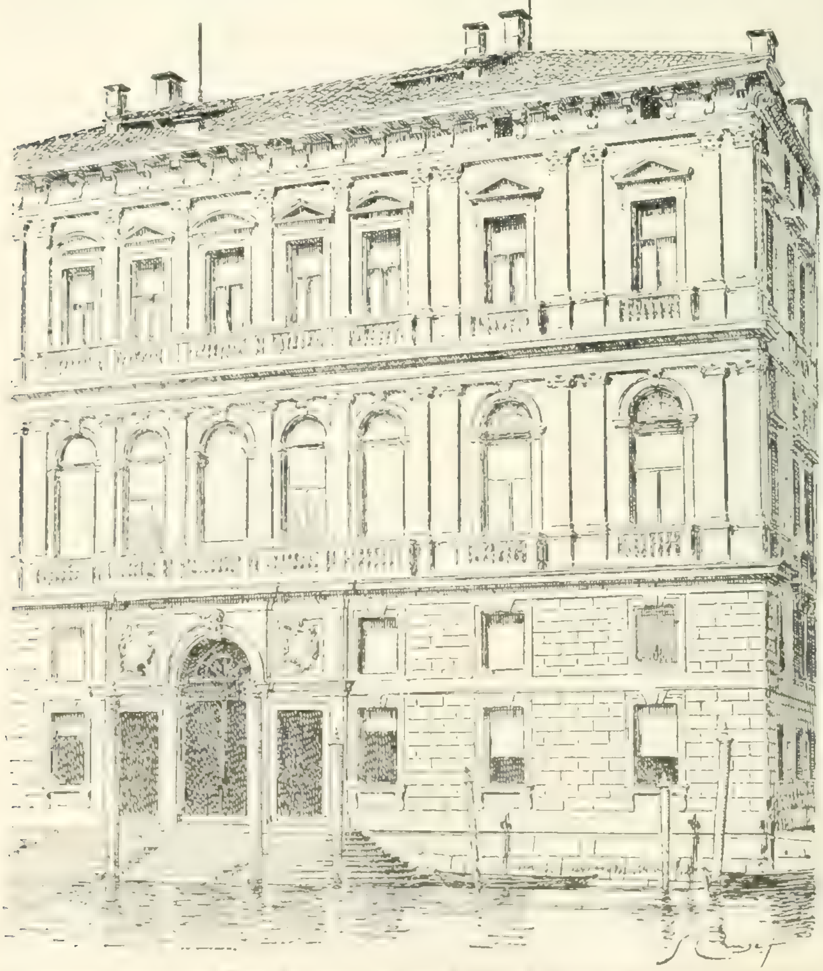
BASE COURT. *A.* The inferior or outer court of a mansion.

B. The rear court of a farmhouse for domestic animals, and connected with the outbuildings.

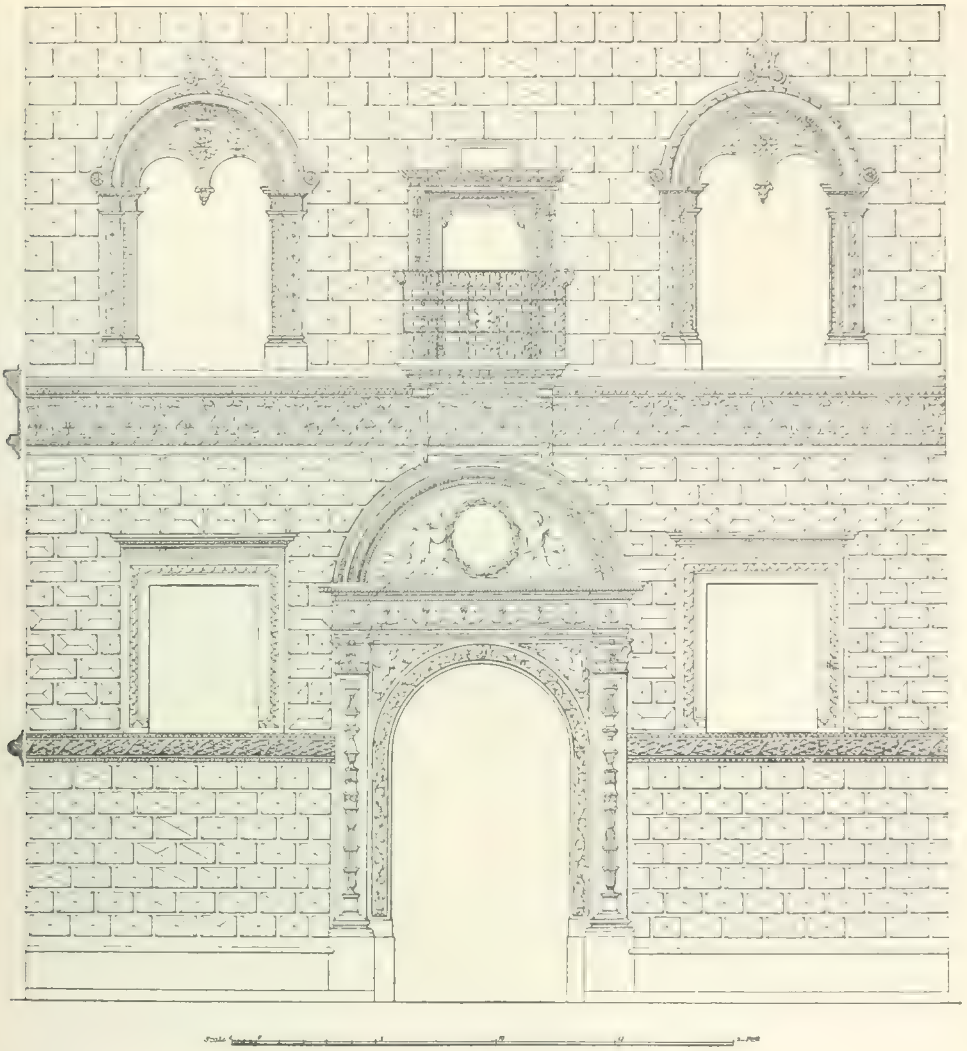
BASE LINE. *A.* In architectural drawings, the lowest horizontal line; the line which marks the base or bottom of the design; especially, in perspective, the trace of the picture plane on the ground plane.

B. In engineering and surveying, the first line determined upon, located, and measured as a base from which other lines, angles, and distances are laid out or computed in surveying or plotting a piece of ground for a map or plan.

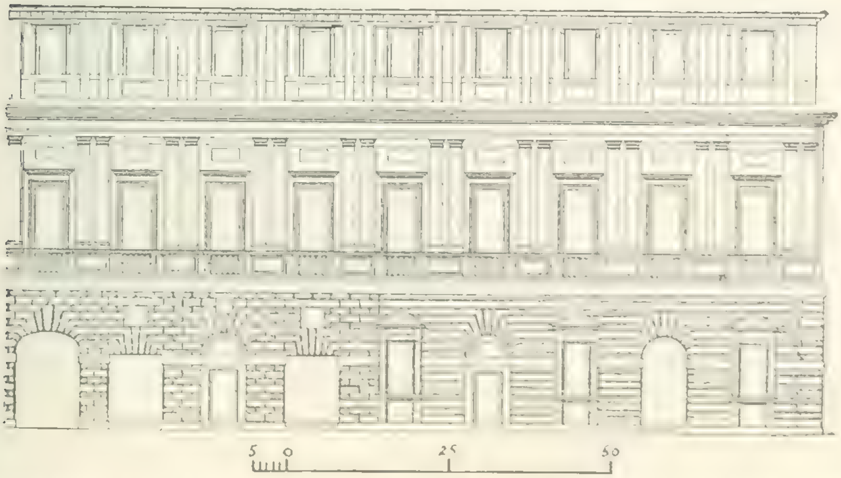
BASEMENT. *A.* The lower part of the wall or walls of any building, especially when divided from the upper portions in an architectural way, as by a different material, a different and perhaps more solid architectural treatment, smaller and fewer win-



Basement, including Two Stories, of the Building Palazzo Grassi at Venice, 1705 A.D.



BASEMENT: PALAZZO BEVILACQUA, BOLOGNA.



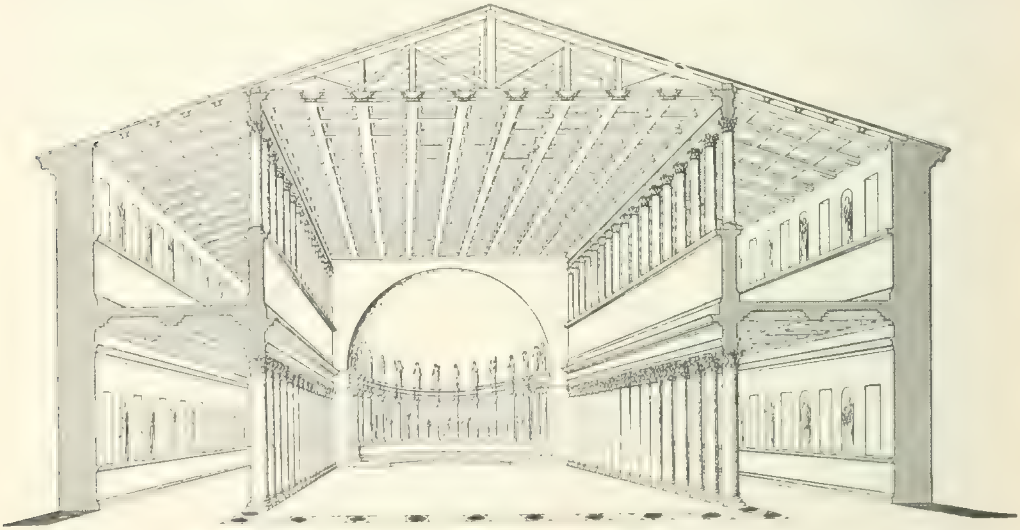
BASEMENT AS HIGH AS THE PRINCIPAL STORY — ABOUT 23 FEET. PALAZZO STOPPANI, ROME, 1515–1520 A.D.

225 226

dows, or the like. The basement may occupy only a small part of the whole height of the structure, or it may be even more than half of that height, as in some palaces of the Italian Renaissance, especially in North Italy. It frequently happens that there is a double basement; that is to say, the basement proper, serving as a foil and a support to the more elaborate story or stories above, has itself a still more massive basement, probably without openings.

B. The story which comes, in the construction of the building, behind the piece of wall above described; in this sense, an abbreviation of the term "basement story." Originally, this story would have its floor almost exactly on a level with the street without, or with the courtyard; but in some buildings it is raised several steps above the street, and in others its floor is some distance below the street, as, notably, in city dwelling houses. (See Basement House, under House.) (Cuts, cols. 225, 226.)

— R. S.



Basilica: Restoration by Palladio of a Typical Roman Basilica.

American Basement; **English Basement**; **French Basement.** (See Basement House, under House.)

BASEMENT STORY. Same as Basement, *B.*

BASE STONE. Same as Footing Stone.

BASEVI, GEORGE; architect.

Basevi entered the office of Sir John Soane (see Soane) in 1810. In 1818 he went to Italy for three years. In 1825 he designed Belgrave Square, London, and in 1835 the Fitzwilliam Museum, Cambridge. With Sidney Smirke (see Smirke) he built the Conservative Club in Pall Mall, London. Basevi was killed by a fall from a scaffold while inspecting the tower of Ely Cathedral.

Redgrave, *Dictionary of Artists.*

BASILE, GIOVAN BATTISTA FILIPPO; architect; d. 1891.

A distinguished architect of Palermo, Italy. Basile made one of the best designs in the competition for the façade of the Cathedral of Milan. He built the Victor Emmanuel Theatre in Palermo, and was director of the Royal Italian School of Engineering. He published *Curvatura delle Linee dell' Architettura Antica* (2d ed., 1896, with atlas, folio), *Calcolo di Stabilità della Cupola del Teatro Massimo di Palermo* (1878, 8vo), and other works.

American Architect, Vol. XXXIII., p. 46.

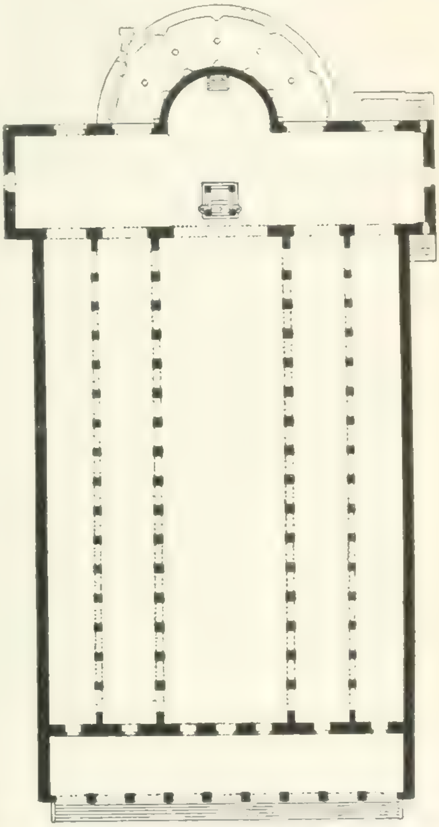
BASILICA. (The Greek adjective signifying "royal," "kingly," and, therefore, "splendid," and the like; used in Latin substantively by writers of the classical time. The signification would be *basilica stoa*, "the royal portico," or, perhaps, in Latin usage, *basilica ædes*, "the royal house.")

A. In classical antiquity, a building intended for the meeting of great numbers of persons for business purposes, like the modern Exchange, and for the sitting of judicial tribunals. It appears that the earliest building called by this name was built in Rome in 184 B.C., by Cato the Censor. This was called, from his family name, Basilica Porcia. The Basilica Fulvia was built 179 B.C. The Basilica Sempronia was built soon after (170 B.C.) close upon the Forum on its northeastern side, and following this the Basilica Opimia and the Basilica Emilia, both named by Pliny in his *Natural History* as two of the four most splendid buildings in Rome. All of these buildings have remained wholly unknown to modern archæologists, and this either because of complete destruction or because of uncertainty of site resulting from the very limited character of the explorations so far made, north of the Forum. The Basilica Julia, later than either of the buildings above named, begun during the short dictatorship of the great Julius and finished by Augustus, is known to us, so far as its plan and general arrangement goes; it stands on the southwestern side of the Forum. All of these buildings were intended to enlarge, in a sense, the available space of the Roman Forum, by partly enclosed and roofed porticoes instead of open squares. Other great basilicas were added by the different emperors, of which the most extensive was the Basilica Ulpia, connected with Trajan's Forum on the northwest, and built by that emperor or in his name. We learn of no basilicas of the provincial cities which are comparable with those of the Imperial City in size and architectural importance.

It was characteristic of all these buildings that they were specimens of trabeated construction throughout. They were nearly as columnar in their character as the porticoes of the Greeks, nor does it appear that the favourite Roman system of vaulting was introduced in any of those named above or in any basilicas of the same period. The general character was a nave and two aisles, one on each side. These aisles, in the majority of cases, returned at either end, so that the nave, as it may be called, was in reality a higher central portion surrounded on every side by lower porticoes. The Basilica Ulpia is described under Roman Imperial Architecture (which see). It is, however, the opinion of some that here the central space was not properly a nave, but was open to the sky, in which case the building would have been a double portico surrounding an open court. It is, of course, not impossible that it was built originally open to the sky, and was afterward roofed. As to distribution of the court rooms in all the basilicas, this is very uncertain, but it is generally agreed that the semicircular apses, projecting sometimes at one end, sometimes at the side (see Exedra), were used for this purpose.

In the reign of Maxentius (d. 312 A.D.) was begun a vaulted basilica which is still partly in existence (see below). The central compartment on the southwestern side seems to have had a great entrance from the Forum; the opposite compartment on the northeastern side has an exedra. At the northwestern end there is either an exedra or apse, and at the southeastern end a great narthex; but there has been no exhaustive examination of the foundations, and only the existing walls and vaults are sufficiently known.

B. A Christian church of the earliest western or central Italian type, distinguished by having a long and comparatively narrow nave and aisles with an apse at one end and a narthex and perhaps an atrium at the other. (For the description and history of the Christian basilica, see Latin Architecture.) The same type appears in the north in such buildings as the Basse Œuvre (which see) at Beauvais in northern France, the church at Cravant, and one of those on the island of Reichenau in the Sea of Constance. Moreover, of the ancient Cathedral of Cologne, and the magnificent Church of S. Martin at Tours there remain such complete accounts, traditionally and in writing, that we are sure of the completely basilican character of those important structures.



BASILICA OF S. JOHN LATERAN AT ROME, AS BUILT IN THE 5TH CENTURY A.D.
[illegible]

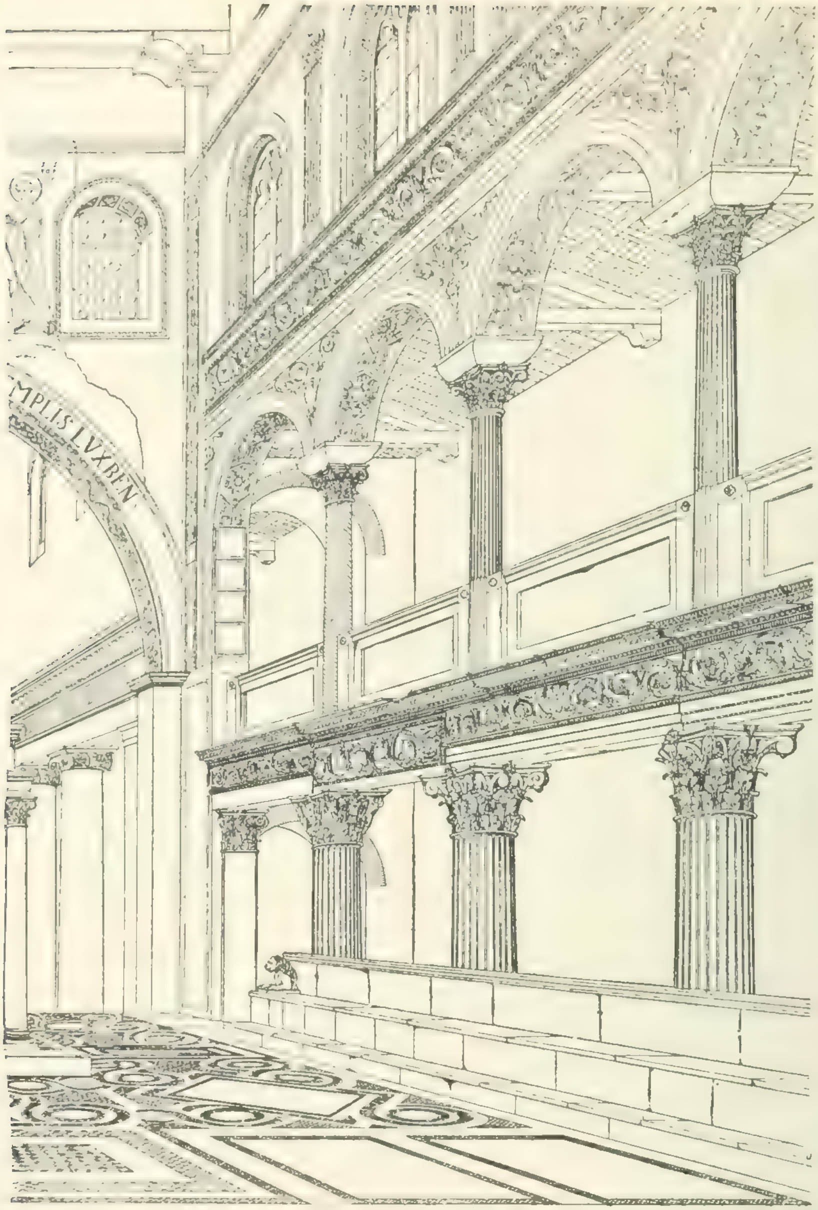
(For bibliography see those under Roman Imperial Architecture; Italy, [illegible] Latin Architecture; Romanesque Architecture.) Also see Bunsen, *Die Basiliken [illegible] Roms*, Munich, 1842.

— R. S.

Ambrogian Basilica. That of S. Ambrogio at Milan. (See Church.)

Liberian Basilica. That of S. Maria Maggiore at Rome, so called from the bishop of Rome, Liberius, 352-366. (See [illegible].)

BASILICA (The, so-called, at Pæstum). A building standing among the ruins of the ancient



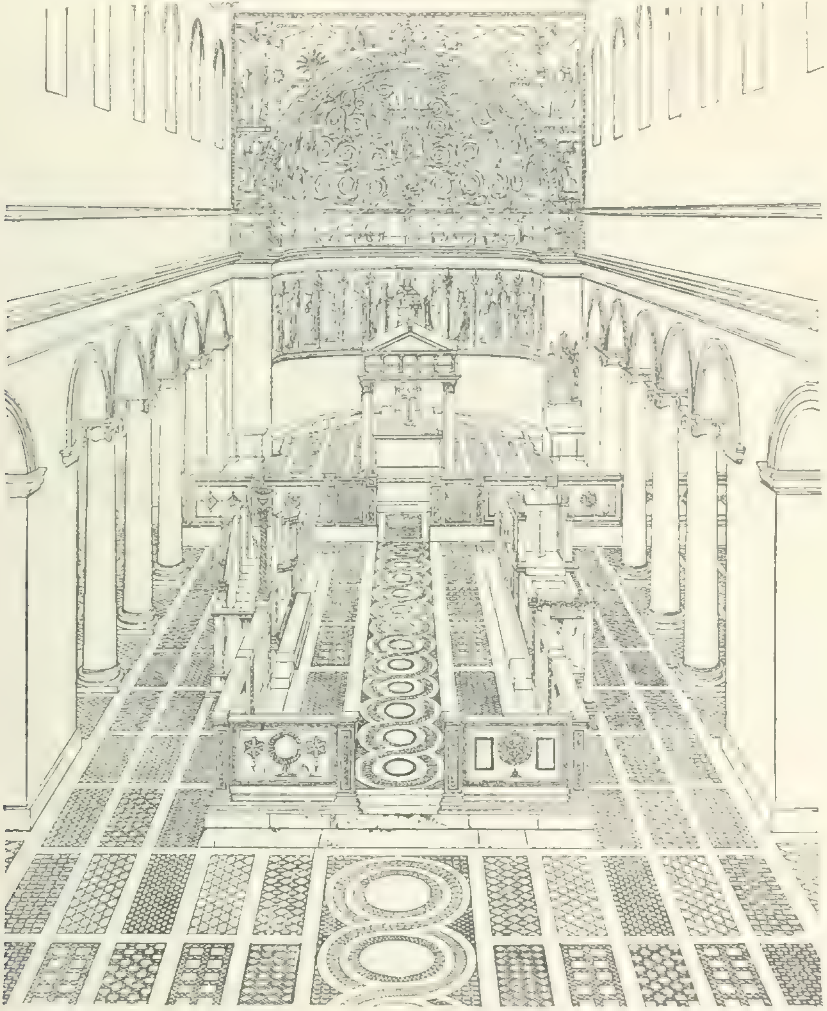
Basilica of S. Lorenzo without the Walls. In Part of the 4th Century A.D., made up of Fragments of Imperial Work.

Paestum (Greek, Poseidonia; modern Italian, Pesto) on the coast of Campania. It resembles a Doric temple, but has the peculiarity of a row of columns through the middle, and in consequence an uneven number on each of the narrower fronts. It was thought that there were no traces of a wall which might have enclosed the naos; and for these reasons it was called a basilica of the ancient or pagan type; that is to say, a portico for public resort.

Koldewey and Puchstein, *Die Griechischen Tempel in unteritalien und Sicilien*, Berlin, 1899.

BASILICAN. Having to do with a basilica; having the characteristics of a basilica; thus, the early churches of northern France, such as S. Martin of Tours, were of basilican plan.

BASILICA OF MAXENTIUS. Erected in Rome by the would-be emperor, Maxentius, and completed by his conqueror, Constantine "the Great," in the first quarter of the fourth century A.D. The building covers an immense parallelogram, divided into a nave vaulted in three squares, and, on each side, three nearly square compartments, each group or set of three corresponding nearly to one of the aisles of a mediæval church. The plans of these compartments differ slightly. The height of the nave is about 125 feet; that is to say, nearly equal to the height of the nave of Amiens Cathedral, although the Roman building is of prodigious solidity and the Gothic cathedral slight and elastic in build. This building, with the halls of the latest imperial thermæ, are peculiarly interesting, as showing how certain forms of architecture still flourished at a time when the art of sculpture was much degraded, and when this decay had been advancing with incredible rapidity.



Basilica of S. Clemente, Rome; Rebuilt in the 11th Century on the Old Plan.

BASILICA OF S. AGNESE (*Fuori le Mura* or Without the Walls). Near Rome. (See Church.)

BASILICA OF S. CLEMENTE. In Rome. (See Church.)

BASILICA OF S. LORENZO (*Fuori le Mura* or Without the Walls). Near Rome. (See Church.)

BASILICA OF S. PAUL (*S. Paolo Fuori le Mura* or Without the Walls). Near Rome. (See Church.)

BASILICA OF TRAJAN; BASILICA ULPIA. The great basilica built by or in the name of the Emperor Trajan in connection with his forum, the temple dedicated to him, and the famous column which still stands complete. It was named from Trajan's Gentile or family name. (See Basilica; Roman Imperial Architecture.)

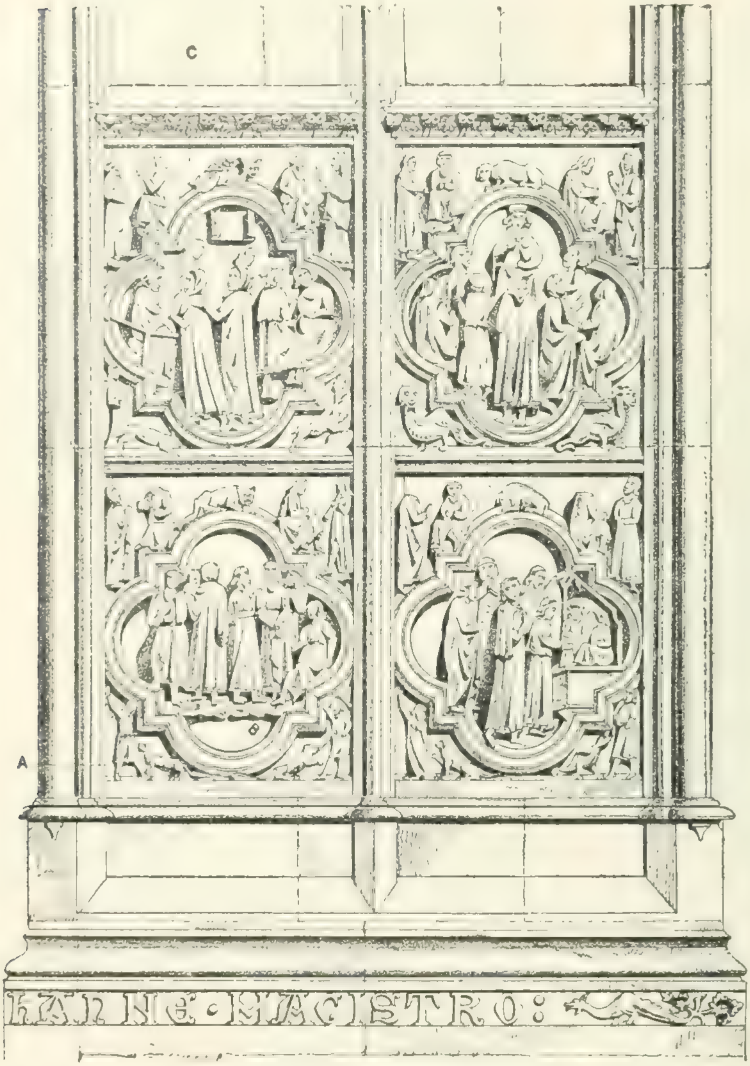
BASIN. *A.* A vessel generally round, elliptic, or ovoid, with curved sides, used for holding water, and intended chiefly for washing the hands and the face. In plumbing, the "set" or stationary earthen or china wash basin set beneath a marble or earthen slab, with metal or other supports, and with waste, overflow, and supply pipes, faucets, trap, and other appurtenances, the waste outlet of the basin being generally at the bottom, sometimes at the back, more often in the centre.

B. A more or less artificially constructed reservoir for water; in modern times generally only for decoration, as at the foot of a *château d'eau*, surrounding a fountain, or the like.

— W. P. G.

BASING. Same as Footing.

BASKET (I.). Same as Bell of a capital.



Bas-relief of the 13th Century; Notre-Dame, Paris. Four Panels from a Buttress of South Transept.

BASKET (II.); **BASKET GRATE.** (See Grate.)

BASON. Same as Basin.

BAS-RELIEF. *A.* A form of sculpture in which the figures project but slightly from the general background; low relief; as, for example, in the frieze of the Parthenon.

B. Any sculptured work thus executed in low relief.

Bas-relief is especially used as an adjunct to architecture. The contrasting treatment of sculpture is high relief or Alto-rilievo.

BASSALECTUS; BASSALLECTUS. (See Vassallectus.)

BASSANO, ANNIBALE; architect.

According to the records, the Loggia del Consiglio in the Piazza dei Signori at Padua was begun in 1493 from the model of Annibale Bassano. It was completed after 1523 by one Biagio da Ferrara, of whom nothing more is known.

Paoletti, *Rinascimento in Venezia*, Vol. II., p. 287 (1897).

BASSEN, BARTOLOMEUS VAN; painter and architect.

In 1613 Van Bassen was a member of the guild of painters at Delft. In 1622 he went to The Hague. After a visit to England, he settled at Arnheim and designed the façade of the *Rathhaus* of that city. He held the office of city architect at The Hague.

Galland, *Holländischen Baukunst und Bildnerei.*

BASSE ŒUVRE. At Beauvais (Oise), north of France. A very ancient church of unsettled date, perhaps as early as the sixth century. It was the cathedral until the choir of the new (unfinished) cathedral was completed in the thirteenth century. One tower of the Basse Œuvre is of the same date.

BASSE-TAILLE. *A.* Bas-relief; the older French term which was in use until the seventeenth century. It has passed into English as a term used by collectors and dealers in ancient works of art.

B (as an adjective). Having a background with figures in relief; said of a piece of enamel, and of the kind of enamel so characterized. It is a variety of *champlevé* enamel, marked by the peculiarity that the background is sculptured and that the enamel itself is translucent so as to show the background.

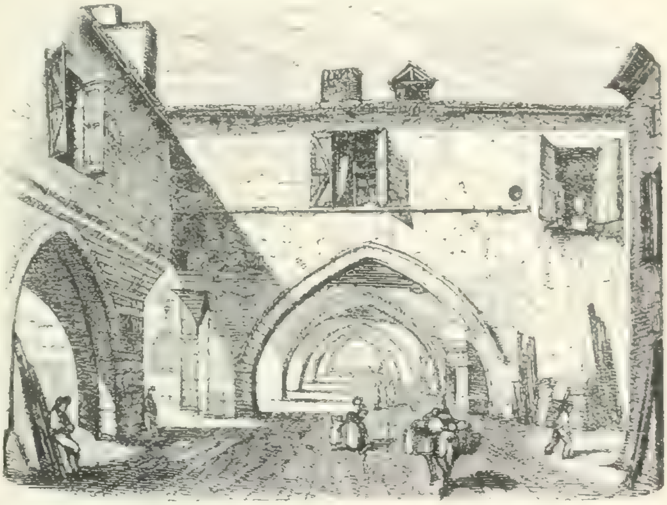
BASSO-RILIEVO. Same as Bas-relief.

BASTARD CUT; SAWED. Sawed from a log longitudinally by parallel cuts in regular sequence from one side to the other. Said of a board or plank so cut. (Compare Quarter Cut; see Lumber.)

BASTARD GRANITE. A quarrier's term for nearly any stone which he may not consider a true granite; particularly applied to gneiss. — G. P. M.

BASTEL HOUSE. On the English and Scottish border, a partly fortified house; one whose lowest story is vaulted, and which has battlements or some defence for the gate.

BASTIDE. *A.* In France, a city or town built for special purposes of defence and with the purpose of occupying an important position by a garrison, properly sheltered and housed; especially, one of those founded, as it is thought, by the English kings as monarchs or claimants of Aquitaine. The most important of them appears to have been Libourne, on the Dordogne, founded about 1290, still a place of some importance. Monpazier, farther east, and south of the same river, retains its original aspect. The bastides are peculiar in mediæval architectural history for their straight streets, forming right angles with one another, and the exact placing of the public buildings, all indicating the building of the city at one time on a systematic plan.



Bastide: View of the Public Square and Covered Street Adjoining, at Monpazier (Dordogne), Southwestern France.

B. Anciently, in fortification, an isolated defensive work, sometimes forming part of a permanent system of defence, sometimes used by the besiegers in an attack on a fortified place.

C. In southern France, a small country house near a town, and used more for occasional resort than for residence. — R. S.

BASTILLE. In French, a bastion, fortified tower, or, according to the epoch, other work of mediæval fortification; especially, and always in English, the strong building whose proper name was *La Bastille de la Porte S. Antoine*, which was built by Charles V. It was for many years the chief state prison of France, and in that capacity was especially hated by the populace, who took it at the beginning of the French Revolution (July 14, 1789) when it was but feebly garrisoned. It was destroyed by order of the municipal authorities of Paris.

BASTILLE HOUSE. Same as Bastel House.

BASTI, MATTEO. (See Pasti, Matteo de.)

BASTION. In military architecture, a projecting member; a combination of rampart, parapet, ditch, etc., by means of which a stretch of wall is flanked so that its face may be swept by the fire from the bastion. In the fortification of the times just succeeding the introduction of gunpowder, the bastions had some architectural character, in partial reminiscence of the flanking towers of mediæval castles; they were, moreover, of masonry with somewhat high walls, and presented an imposing appearance. The modern bastion is, of course, to outside appearance, a mere green slope like a natural hillside, but more regular. In manor houses and other large country residences of the later fifteenth and the sixteenth centuries, an enclosing wall and ditch was often used to protect the immediate surroundings of the house; its stables, gardens, and the like, as well as the house itself, and the angles of this outer enclosure were frequently treated with projections simulating the bastions of regular fortifications. — R. S.

BASTON. Any large moulding of convex rounded section. (Compare Torus.)

BAT. *A.* A piece of a broken brick; usually the half or about the half of a brick, especially when having one end unbroken. More usually called brickbat. (See Closer.)

B. A kind of sun-dried brick.

BATARDEAU. Same as Coffer Dam.

BATEMENT LIGHT. In English Gothic traceried windows, a peculiar form of light, or subdivision of a window, one comprised between two mullions, and having a curved or pointed bottom caused by the arched heads of other lights below.

BATH. *A.* The immersion of the body, or of a part of it, in water or other liquid. By extension, the contact of the skin with, or exposure to, a semisolid, liquid, or gaseous substance, or with imponderable matter like sunlight or electric currents.

B. An arrangement or apparatus for bathing; hence, an apartment or building containing baths.

The object of bathing is improvement of the bodily health, (*a*) by maintaining health, (*b*) by restoring health. The first result is accomplished by cleansing baths, and by baths taken for cooling, stimulating, or hardening purposes, or for athletic bodily exercise; the second object by medicated baths. The numerous kinds and forms of baths may be classified: (1) according to the medium or substance used (fresh air, salt water, mineral water, hot air, steam, vapour, mud and sand, sun and electrical, air, pine needle, hot springs and medicated baths); (2) according to temperature (cold, tepid, warm, hot baths); (3) according to manner of application or part of body treated (full bath, half bath, sitz, hip, foot, hand, eye, sponge bath, douche, spray); (4) according to purpose, viz.: cleansing baths (tub, spray, douche, foot, sitz, hip, and vapour baths); refreshing baths (douche, needle, sponge, wave, swimming or plunge, river and sea, and Turkish baths); curative baths (air, sun, hot air, vapour, mud, sand, sulphur, electric, galvanic, hydropathic, and other baths); (5) in single baths (tub, sponge, douche, needle, and shower), and common baths (swimming tanks, river and sea baths, hot air, and vapour baths); (6) according to location (baths in private houses, public baths, factory, school, hospital baths, river baths, sea and surf baths, mineral springs, and thermæ). (See Bath House.) — W. P. GERHARD.

Douche Bath. (See Douche.)

Needle Bath. A bath in which water is applied to the body in a number of rows of very fine jets. (See Bath.) — W. P. G.

Rain Bath. A special form of shower bath, with inclined overhead douche, intended as a substitute for tub baths, over which it has many advantages. (See Bath House.) — W. P. G.

Shower Bath. A special form of bath for applying water in finely dispersed particles or jets over the body. (See Bath House.) — W. P. G.

Sitz Bath. A special form of bath tub, intended for the bather to sit in, for immersion of the hips. — W. P. G.

Swimming Bath. (See under S.)

BATH HOUSE. A building erected for bathing purposes, and fitted up with some or all of the conveniences and appliances for bathing, such as dressing rooms, bath tubs, douches, needle baths, foot baths, hot air, vapour, steam, and electric baths, swimming baths, and sometimes also containing hot springs and medical baths.

For historical notes on bath houses see under "Thermæ." In the present century the Public Bath and Washhouse Act, passed in England in 1846, gave the first impetus to the erection of public bath houses, and many such establishments were built in cities and towns, not only in England, but also on the Continent. But the admission fee charged and the comparatively elegant exteriors and interiors of bath houses debarred the poorer classes. In 1883 the Berlin Health Exhibition stirred up public sentiment in favour of people's baths; a like movement took place in the United States in 1891. The need of luxurious public bathing establishments is not felt in America, because most dwellings of even inferior class have bathing conveniences; but, in the cities, need is felt of cheap spray or rain baths for the masses, who lack bathing facilities at home. One good reason why municipalities should provide people's baths is because they reduce the general mortality of a city and the number of sick in the hospitals. The state of New York initiated, in 1895, by a legislative act, the establishment of public baths kept open throughout the year. Such bath houses exist now in New York, Buffalo, Rochester, and Yonkers, and, in other states, at Philadelphia, Boston, Chicago, Pittsburg, and Brookline.

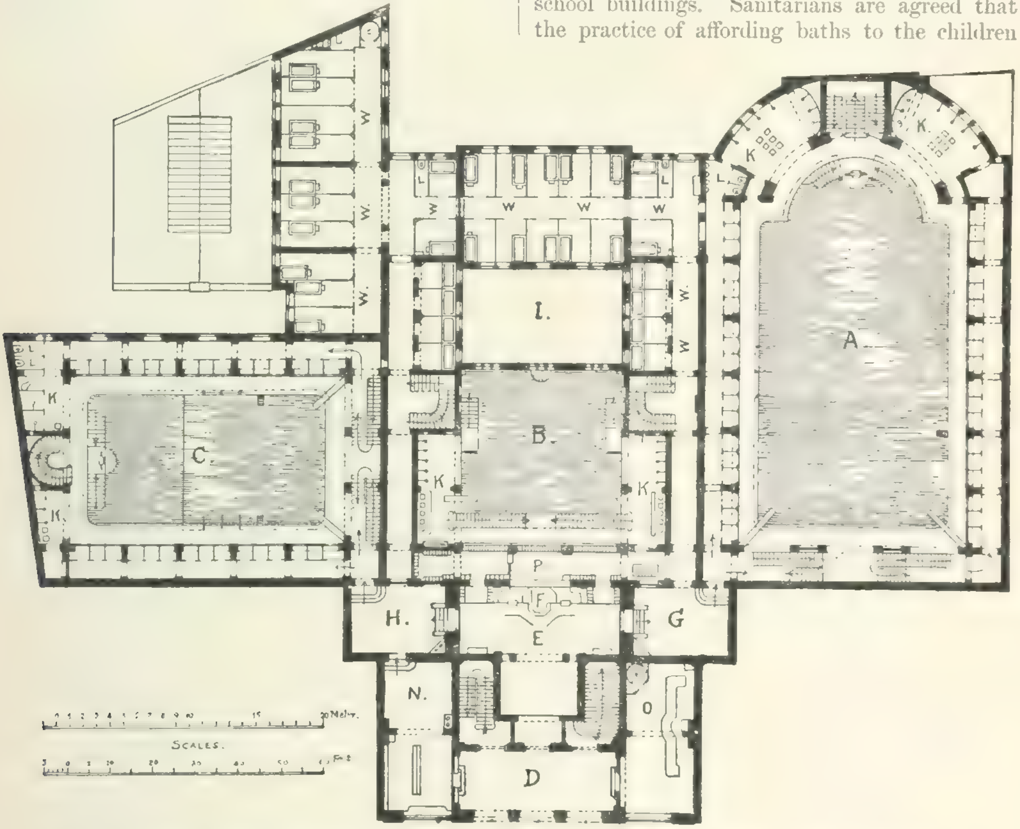
In planning a bath house, the chief questions are: (1) Shall single baths (tubs, douches), or common baths (swimming tanks, hot air and steam vapour baths), or both, be provided? (2) Shall the single baths be fitted with tubs or with sprays?

Elaborate bath houses for well-to-do people generally embrace all the different kinds of baths. Such buildings comprise apartments with bath tubs (often designated in England as slipper baths, though strictly speaking the latter is a short bathing receptacle in the form of a shoe in which the bather sits erect, while being partly covered in); needle and spray baths, large swimming tanks with preparatory cleansing foot tubs and douches; Russian and Turkish baths, massage and shampoo rooms, lounging rooms for cooling and resting after treatment, refreshment and reading rooms, hairdressing establishments, etc. They are either provided in duplicate for men and women, or else, when the building is small, different days or hours are appointed for the two sexes. The figure shows an example of a large modern bath house, viz. the ground floor plan of the new municipal bath house at Frankfort-on-the-Main, completed in 1892, at an expense of about $200,000. (The illustration is taken from *Fortschritte der Architektur*, Part XI.)

People's baths, as a rule, do not contain swimming tanks, for these are not intended for cleansing purposes. Instead of being provided with tubs, they are nowadays always fitted up with rain or spray baths, because these afford superior advantages in a hygienic sense. Different forms of mixing valves are used to obtain tepid water of proper temperature from the hot and cold water supply pipes. Sometimes the cold water is warmed by means of steam, which passes through tubes surrounded by water, the latter flowing upward, while the steam travels in the opposite direction. The chief hygienic advantage of the rain bath lies in the fact that the bather is not surrounded by water, as when sitting in a bath tub, the water of which soon becomes soiled. Almost as fast as the clean water in form of a tepid spray is delivered through the overhead douche over the bather, it passes away more or less soiled from his ablution through the floor drain. Other advantages are the invigourating and tonic effect of the spray, and the fact that this form of bath is less expensive to fit up, requires less time in application, uses less water, and that the apartment is quickly gotten ready for the next bather.

The value of rain or spray baths is not confined to people's baths only. In hospitals for instance, where the bathing of patients in tubs formerly led to abuses and involved the danger of scalding patients, spray baths are now preferred. In all hospitals for the insane of New York State bath tubs are abolished, and spray baths have been substituted. They are placed either in single stalls in the wards, or in congregate bath rooms or bath houses, of which good examples may be seen at the Utica State Hospital, and the Long Island State Hospital, at Kings Park, L.I.

Following the success of people's rain baths, a movement was inaugurated in Germany to provide cleansing baths for the children in public school buildings. Sanitarians are agreed that the practice of affording baths to the children in public schools does more to improve the air of the class rooms than any system of artificial ventilation. Such school baths would prove a boon to the children of the tenement population in American cities. Neither bath tubs nor swimming tanks are adapted to the needs of workingmen in factories, and here again the tepid rain bath offers many advantages and can be cheaply procured, as manufacturing establishments generally have an abundance of waste or exhaust steam. (See also article on Swimming Bath.) — W. P. GERHARD.



BATH HOUSE: NEW MUNICIPAL BATH HOUSE AT FRANKFORT-ON-THE-MAIN; GROUND FLOOR.

A. Swimming bath, first class, for men.
B. Swimming bath, second class, for men.
C. Swimming bath for women.
D. Open vestibule.
E. Inner vestibule.
F. Ticket office.
G. Waiting room for men.
H. Waiting room for women.
I. Inner court [illegible].
K. Cleansing and preliminary baths.
L. [illegible]
N. [illegible]
O. [illegible]
P. [illegible]
W. [illegible]

BATHING BOX. In England, a booth for dressing, etc.; same as Bathing House, *B.*

BATHING HOUSE. *A.* Same as Bath House. (See also Swimming Bath.)

B. A small room or booth for undressing and dressing, and set up on the seashore or at the edge of a river or the like where bathing is common. Such booths are often made of a light wooden frame with strong muslin or canvas nailed to the uprights and horizontals. When made entirely of wood, they are usually covered with rough boarding. A floor is always needed, and a shelf, some hooks, etc., are usually provided.

BATH OF MORTAR. Mortar used in large quantities, as when it is laid thick upon a horizontal surface as of a partly completed wall or pier, that small materials may be bedded deeply into it. The most important masonry of the Romans of the Empire was made with small stones bedded in a bath of mortar, the wall being faced with small bricks or tiles of baked clay.

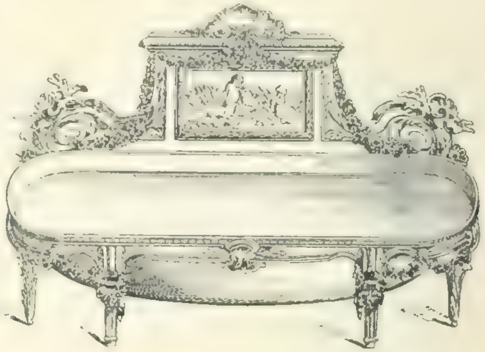
BATHROOM. A room provided with a bath tub or other appliances for bathing. In modern houses of ordinary cost, bath tub and hand basin, with hot and cold water faucets, and in many cases also, a water-closet fixture, constitute its equipment. In superior houses the water-closet is separate, and there is the fixed sitz bath, a shower bath, which may also serve as a douche, and a needle bath, or one or two of these fittings. Moreover, the possibility of bathing in flowing water is kept in view, and a marble tank with elaborate appliances sometimes replaces the bath tub.

BATHS OF CARACALLA; OF DIOCLETIAN, etc. (See Thermæ.)

BATH STONE. Bath Oolite; a light cream-coloured or nearly white, soft, oolitic limestone from the English Jurassic formations. Somewhat resembles the American "Bedford Stone," but is softer and of lighter colour. Much used in English ecclesiastic architecture. — G. P. M.

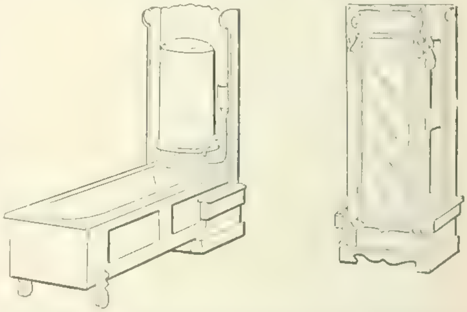
Bath Tub: "Sofa" Bath, 18th Century.

BATH TUB. A receptacle of sufficient size and of proper shape to enable a person to immerse the body in water, for washing and bathing purposes, and, in modern buildings, a stationary plumbing fixture, generally provided with waste and overflow pipes, hot and cold water supply pipes, plug and chain or waste valve, and single or combination bibbs (see Bibb Cock). The fixture is either set on the floor, or raised from it on legs, or sunk into the floor.



Bath Tub: "Sofa" Bath, 18th Century.

Examples of fine monolithic Roman bath tubs cut out of large blocks of granite or marble are on exhibition in some of the museums of Europe. Similar marble baths of great splendour were constructed for the French kings. It was usual to place in the tub a linen sheet, as the sides were cold, and this custom has remained in France up to the present day. Marble tubs being costly and cold, bathing tubs were subsequently made of wood and of sheet metal. Some curious varieties, like the "sofa" baths illustrated in the Figures were designed by the French furniture makers of the past centuries. A "mechanical" bath tub, the invention of a certain French count, is mentioned, in which the water was constantly kept in motion to imitate the effect of a river or surf bath. A similar device, called a "*Wellen*" or "*Schaukel-bad*" has attained some popularity in Germany at the present day. Another curious out-of-date form of bath tub, the so-called "slipper bath," consisted of a tub in the shape of a shoe, and partly covered, in which the bather sat erect with his feet in the toe of the slipper. The object of the



Bath Tub: Stationary Folding "Cabinet" Bath Tub, with Water Cistern which can be connected with Heater.

covering was to prevent the spilling of water, to protect the bather, and to enable a person to take a long soaking bath, as required by some medical practitioners. In some of the towns of Provence in the south of France slipper baths may be found at this day. In England, the modern tub baths are sometimes designated as "slipper baths" (see Bath House). The modern bath tub, as used in private houses, is manufactured of wood lined with zinc or with copper; of heavy copper; of cast iron or sheet iron, painted, galvanized, or enamelled; of porcelain or stoneware, and, quite recently, of glass. In the older patterns, the long sides are tapering in plan and also from the top toward the bottom; all recent tubs have parallel sides which make the tub more roomy. The head end of the tub is semicircular in plan and commonly sloped; sometimes both ends are sloped and built symmetrical. The length of tubs varies from 4 feet to 6 feet 6 inches; the width varies from 22 inches to 32 inches; according to the inside depth the bath is called either a shallow or a deep tub.

Special forms of tubs, for bathing only parts of the body, are the Sitz Bath (which see under Bath), the foot bath, the bidet, and the cleansing tubs arranged in modern swimming baths for bathers to take a thorough ablution with soap and warm water before they are permitted to enter the swimming pool.
— W. P. GERHARD.

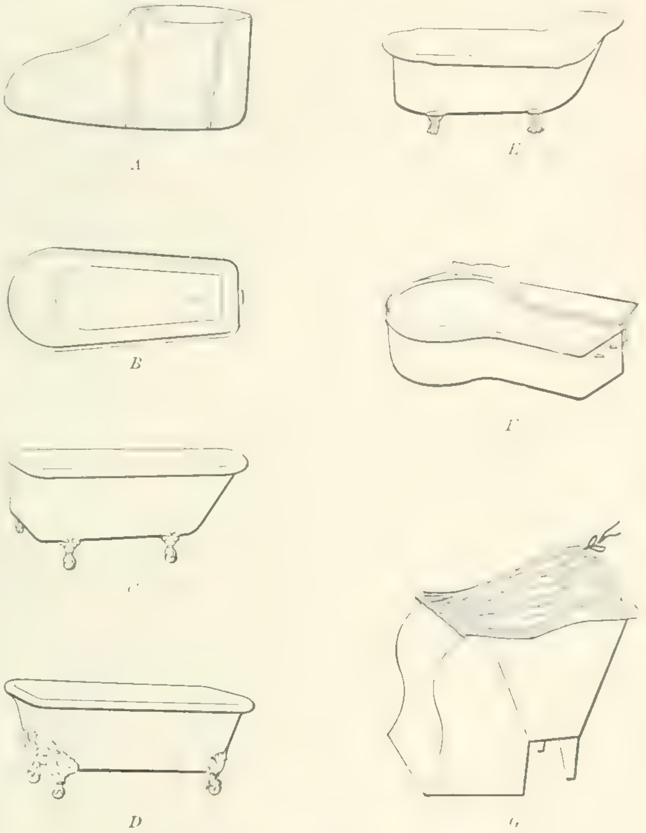
BATONS ROMPUS. The short straight billets or portions of moulding, usually of rounded section, which form the Zigzag Moulding in Romanesque architecture. In its English use it is a collective noun. (Compare Chevron.)

BATTEN. In English usage, a plank of 7 by 2½ or 7 by 3 inches, which may be cut into three boards or deals. The term is also applied to furring strips for flooring or plastering. In American usage, any thin and narrow strip of wood such as may be used for nailing over the joints between the boards of the siding of framed houses. (Compare Cleat; see also Lumber.)

BATTENING. The affixing of battens to a wall or frame; or the whole system of battens so affixed. In English usage, the application of furring strips to a wall or roof frame for plastering, or to joists to receive the flooring. This is usually called Furring in the United States.

BATTEN PLATES. Tie plates at the ends of compression members, or used at intervals to connect the channel beams or Z beams, which form the column or strut, replacing, for instance, the latticing on the open side of a built strut or column. — W. R. H.

BATTER. A slope, especially a slight inclination from the perpendicular; specifically, the slope given to the face of a wall, embankment, or the like. In retaining walls, a batter is given to the face of a wall to economize masonry, to prevent overhanging in case of slight movement, and sometimes for æsthetic reasons. It may be a plane, or slightly curved, surface. If, after a wall with vertical faces has been designed to support a given earth pressure, the face line be revolved about a point one ninth of the height from the base to form a batter not exceeding one sixth, the wall will



BATH TUBS OF DIFFERENT FORMS:

A. Slipper bath, ancient form.
B. Old pattern, tapering horizontally and vertically.
C. Recent "French" pattern, parallel sides.
D. "Roman" pattern.
E. Special form with head rest.
F. Special form, seat and slope.
G. Chair for vapour baths, with cover of rubber cloth.

then have the same stability as before. (Van Ness rule.) The word is often said to be derived from the French word *batir*, to build. It is difficult to follow this derivation; the French word for batter is *fruit*.

— W. R. Hutton.

BATTER RULE. BATTERING RULE. An instrument or templet to regulate the amount of batter to be given to a wall or pier in process of construction.

BATTERY, ELECTRIC. (See Electrical Appliances.)

BATTISTA DI CRISTOFANELLO; (*in fregliati*); architect.

The fine church of S. Maria Nuova, near Cortona, Italy, is his only known work. A parchment, preserved in the sacristy of the church, declares that it was begun May 11, 1550, *con disegno di Battista Cristofanello Cortonese*, and finished in 1600. He is also mentioned in Mancini, *Manoscritti della Libreria del Commune dell' Academia Etrusca di Cortona*, 1884. The high altar was added by Rodi da Cortona about 1610.

Geymuller-Stegmann, *Die Architektur der Ren. in Toscana.*

BATTLE, JOHN DE (JEAN DE LA BATAILLE); architect and mason "cementarius."

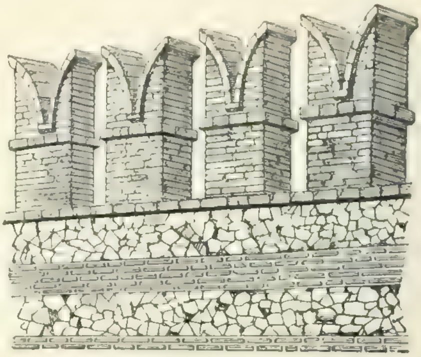
Between 1291 and 1294 John de Battle built the Eleanor Crosses at Northampton, Stony Stratford, Woburn, Dunstable, and St. Albans (England). An associate (*socius*), John de Pabeham, is mentioned. (See Cross of Queen Eleanor.)

Hunter, Death of Eleanor of Castille, in *Archæologia*, Vol. XXIX.

BATTLEMENT. *A.* In fortification, a parapet which is so broken into higher and lower alternate parts that the archer or crossbowman on the rampart may be sheltered by the higher part, and may at will discharge his weapon over the lower part of this parapet. The higher part, the dimensions of which may be taken roughly as 6 feet high above the top of the Rampart with a width of from 5 to 7 feet, is called the Merlon or Cop, and sometimes also Battlement. (See definition *B.*) This merlon is often pierced by a loophole, or even by more than one. The lower piece of parapet between the merlons may be breast high, or somewhat less; its width horizontally is usually about equal to that of the merlons. The open space between the merlons and above the lower parapet is called Crenelle, Crenel, or in later writing, Embrasure, and this term may be held to include the low parapet as well, or the latter may be called the Parapet of the Crenel. The ramparts of Pompeii are defended by battlements of a pattern unknown in mediæval fortification, in which each merlon has a piece of wall returning across a part of the footway on the top of the rampart, thus forming a series of traverses, one for each embrasure, so that each defender of the walls is protected on his left side as well as in front.

Battlements of Decorative Purpose, S. Mary's Church, Beverley, Yorkshire.

These [illegible] smaller than the military battlements and [illegible] merlons, loops and caps which are not [illegible] in the latter.



Battlement of Brick, of Decorative Purpose; Verona.

This is the pattern known as the Scaliger or La Scala Battlement.

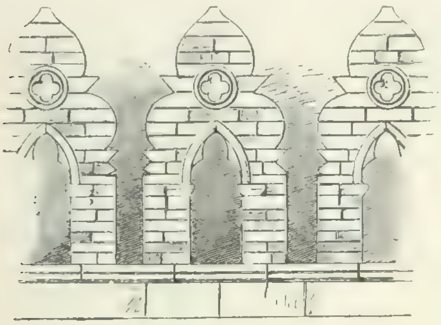
Battlements formed the actual defensive preparation for almost all fortified walls before the introduction of gunpowder, those in early Greece being very like those of the later Middle Ages. Some few exceptions exist to this rule; thus in later Byzantine fortification a vaulted gallery near the top of the wall seems to have taken a large share in the arrangements for defence, and in the castles of Europe, from the thirteenth century on, an elaborate system of wooden outside galleries was used, which galleries were put into place when a siege was feared, or in some cases seem to have remained permanently in condition for use. Even apart from these wooden defences, the defensive parapet of the Middle Ages was often carried on corbels projecting beyond the wall so as to leave openings

Battlement from the Garden Wall of a House in the Calle del Bagatin, Venice.

for the discharge of missiles vertically downward. (See Machicolation.)

B. One of the merlons, or such a merlon with its adjoining crenel, in a battlement in the sense *A*, above. This use, though not recognized by the dictionaries, is warranted by the common use of the plural form, battlements, for the general line or front of such a parapet.

C. A decorative fringe or crest showing against the sky or against a high-ridged roof, common in many architectures, evidently derived from the battlement of fortification, but often unlike it in form, in size, and in solidity. Thus, in the churches of the later Gothic style, battlements are often pierced with ornamental openings, or cut into elaborate tracery, leaving nothing but slender bars of stone. Some forms of battlements are traceable to a defensive purpose, but, as generally seen in buildings which remain intact, are altogether ornamental. On the garden walls in Venice a cresting is formed by brick battlements of extraordinary beauty, and a repetition of this on a large scale is seen in the well-known fringe of marble uprights which crown the wall of the ducal palace in that city. The common form in Moslem architecture is the Almena, in which a stepped slope has the uprights of the steps cut to a backward or reversed slope, giving very picturesque forms.



Battlement of Brick from a Garden Wall, Venice.

— R. S.

BATTLE STONE. (See Cat Stone; Megalithic; Pillar of Victory.)

BAUDROT (BOUDROT), LAURENT and **GÉRARD**; architects.

In 1607 Laurent succeeded Gérard Faulchot in the superintendence of the works at the Cathedral of Troyes. Gérard Baudrot was probably his son, and in 1620 and 1622 appears as employed in connection with the cathedral.

Assier, *Les Arts et les Artistes dans l'ancienne capitale de la Champagne*; Bauchal, *Dictionnaire*; Lance, *Dictionnaire*.

BAUDRY, PAUL JACQUES AIMÉ; painter; b. Nov. 7, 1828; d. Jan. 17, 1886.

Baudry entered the *École des Beaux Arts*, April 16, 1845, and won the *Grand Prix de Rome* in 1850. His greatest achievement was the decoration of the foyer of the Grand Opera in Paris, built by his friend, Charles Garnier (see Garnier), for which the commission was given in January, 1866. This work was interrupted by the war of 1870–1871, but the entire series of thirty-four compositions was exhibited at the *École des Beaux Arts* in 1874. His ceiling, "The Glorification of Law," at the *Cour de Cassation*, won for him the *Médaille d'honneur* in the *Salon* of 1881. Baudry painted two ceilings for the Vanderbilt houses in New York.

Charles Ephrussi, *Paul Baudry, sa vie et son œuvre*; Rene Menard, *Paul Baudry* in *Gaz. des Beaux Arts*; Jules Claretie, *Peintres et sculpteurs contemporains* (deuxième serie); Charles Garnier, *Le Nouvel Opéra de Paris*.

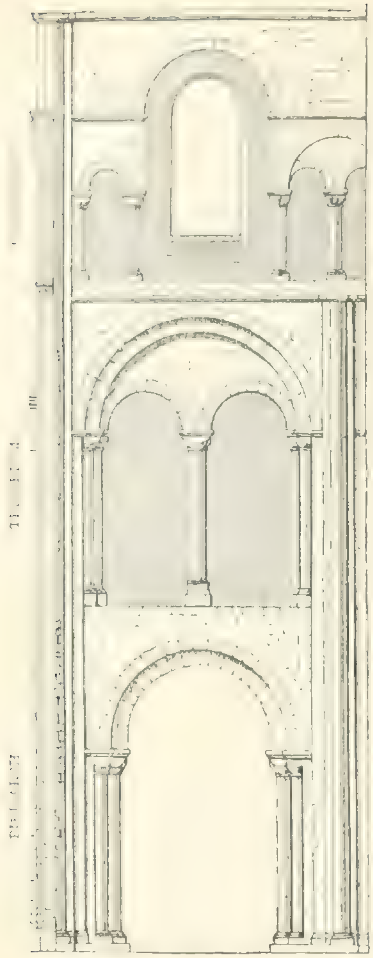
BAULK. (See Balk.)

BAUTA. In Scandinavian archæology, an upright stone, like a menhir, but often crowning a barrow, and sometimes 20 feet high. They are often of such late epoch that the names of persons in whose memory they seem to have been set up are engraved upon them in runes, and therefore they are hardly prehistoric monuments, but belong rather to the Viking age. It is not, however, absolutely certain that the stones themselves may not be of earlier date than their present placing, although the inscriptions are later. (See Megalithic.)

BAWN. In mediæval archæology, a fortified enclosure.

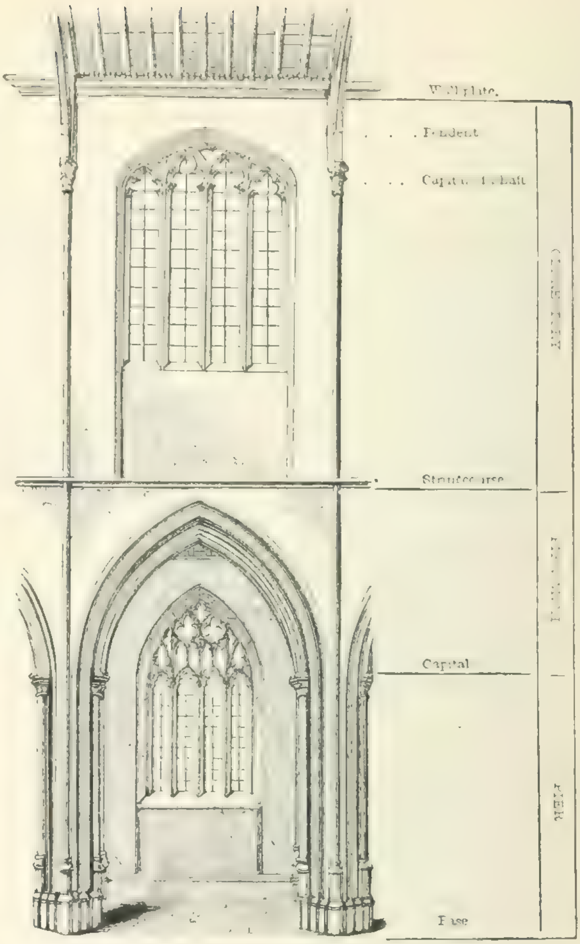
BAY. *A.* An opening, as of a window or door, or as between two columns or piers. In this sense, the French *baie* should be consulted, as it is commonly used for a window. The term in England seems to carry with it the supports, imposts, jambs, and the like, on both sides of the opening.

B. One compartment or division of a building, or other structure, which consists of several similar compartments. The earliest English permanent dwellings, and barns also, although the two were often united, were built in bays, whence undoubtedly the sense *C* below. A house might consist of one bay, or many, and could be rented, sold, or left by will in separate bays; thus, three children might inherit each one bay of a house, and in this way the houses of early times in England, having a nearly uniform section at all points, much resembled the Long House of the Iroquois Indians. The general length of the bay was about 16 feet (see Wood, Construction in, Part I.); and it has been alleged that the measure of length, known as the rod, pole, or perch, is derived from this length of the bay. (See Cruck.) Hence, in later and more elaborate structures, the term applies to a similar division, as of a roof or floor, which is included between any two



BAY OF TRANSEPT: WINCHESTER CATHEDRAL, c. 1090.

The wall of the nave arcade, the triforium, and clerestory are shown white; the more distant wall behind the triforium and upper gallery is shaded. A series of such vertical combinations of three parts makes up the design of the interior.



BAY: FOTHERINGAY CHURCH, NORTHAMPTONSHIRE, c. 1440.

One of the units of design of the interior of a small church in the perpendicular style, with a simple wooden roof. The aisle is seen beyond the pillars of the nave arcade.

main transverse supports of a series. In such connections, the term is commonly used in combination, as in bay of joists, bay of rafters. In modern times the nave or an aisle of a church, or any building divided by arcades or colonnades, is considered as divided into bays, each bay consisting of two columns, pilasters, or the like, with the space between, so that one bay of a three-aisled church consists of a piece taken across the whole building from outer wall to outer wall, including both aisles and the nave. In like manner, one compartment of any single wall or arcade of such a building is spoken of as a bay, and the decoration of a piece of wall around, and enclosing one of the windows, is sometimes spoken of as a unit. (See Bay Window, which common term illustrates both of these definitions, *A* and *B*.)

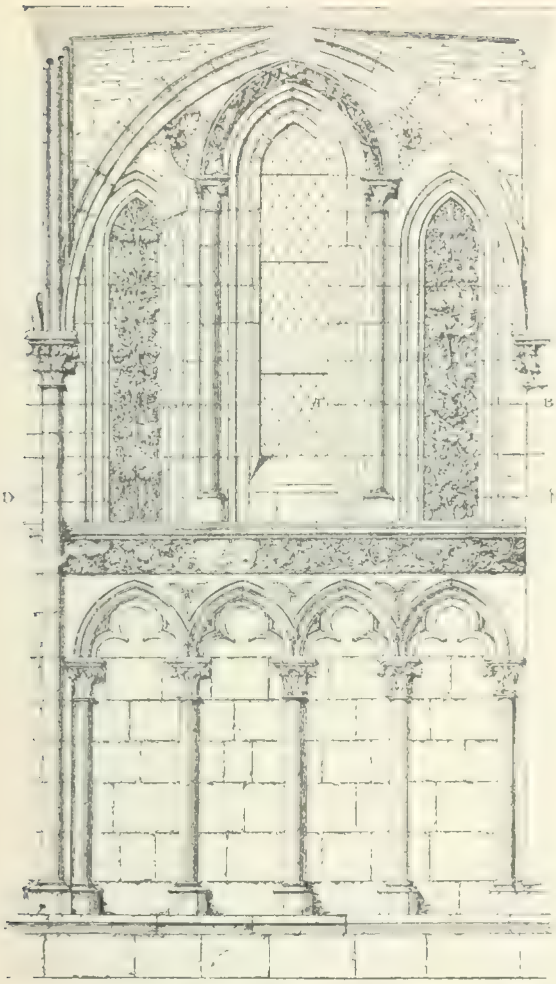
By extension, the term is sometimes applied to divisions, or compartments, of small and relatively unimportant structures, as to the divisions of a bookcase; the spaces formed by the mullions of a window; and, in engineering, to the portion, as of a chord, included between two apices of a truss.

C. By extension, a compartment or recess, as in a barn, for a special purpose, as expressed in the compound terms, "hay bay," "horse bay."

D. In plastering, that piece of the work which is included between two screeds (see Screed, *A*), and which is done at one operation. (Cut, cols. 253, 254.) —R. S.

BAYEUX, JEAN DE (I.); architect; d. 1398.

May 29, 1388, he succeeded Jean des Perriers (Desperriers, or Périer) as *maître maçon* of the cathedral of Rouen, France, and Aug. 5, 1389, became *maistre des œuvres de maçon-*



Bay of the Outer Wall of Choir Aisle; Church at Norrey, near Caen.

An interesting wall arcade below, and very unusual panels filled with carving above. Norman work, 14th century.

nerie of the city of Rouen. In 1390 he made plans for the reconstruction of the "Beffroi" at Rouen. He built a large part of the city wall, including the tower called Guillaume-Lion, and the Porte Martainville, for which he made the plans in 1394.

Deville, *Architectes de la Cathédrale de Rouen*; Lance, *Dictionnaire*.

BAYEUX, JEAN DE (II.); architect.

He succeeded his father, Jean (I.), as *maître des œuvres* of the city of Rouen, but not as architect of the cathedral. April 25, 1398, he presented new plans for the Porte Martainville, Rouen.

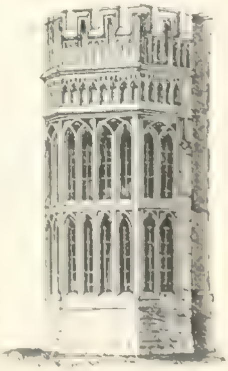
Deville, *Architectes de la Cathédrale de Rouen*.

BAY STALL. A stall, or similar seat, in a bay window.

BAY WINDOW. Originally, a large window, often of many parts, or subdivisions, and corresponding nearly to the modern Italian term, Balcone (which see). The word "bay" in its two senses, first, of a recess or opening, and second, of one of many subdivisions of a long building, seems to have suggested the use of the same term, "bay," for an enclosed structure which would form a recess, or opening, and which, by means of its projection from the exterior wall, would seem to constitute one subdivision, or "bay," as seen from the exterior. This structure was then called bay window, and the term has no closer or more exact signification than is here explained. In modern times an attempt has been made to distinguish the bay window as a structure resting on the ground from the oriel window as a structure corbelled out from the wall of the building. Also a distinction has been attempted between Bow Window with a curved outline in its plan, and bay window with a broken or polygonal outline. As generally understood, in modern country houses and the like, the bay window is of the nature of an enclosed loggia by means of which a view can be had along the face of the walls on each side, and the sun can perhaps be let into a room which would otherwise not receive it; it may be two or three feet deep, or it may be as large as a moderate-sized room with a projection from the wall even greater than its measurement along the face of the wall. In some cases, the bay window is separated from the room which it adjoins by a decided break in the ceiling, as by an arch or transom, and the ceiling of the bay window may be lower than that of the room. In other cases the ceiling is continuous, and the bay window is really a prolongation, or widening, of the room.

— R. S.

BAZAAR. In cities of the Levant, and generally of Southwestern Asia and Northern Africa, that part of the town which is devoted to shops, stalls, or booths, for the sale of objects of all sorts. It is often divided into districts, one of which is occupied by each branch of trade. In a few instances an architectural character is given to the whole quarter, or to one street of it, by roofs through which light is admitted, the great Bazaar of Constantinople being especially remark-



Bay Window, Perpendicular Gothic; Compton Church, Wingate, Warwickshire.

able as being vaulted with stone, and having the light admitted through cupolas. The bazaars of Constantinople, taken all together, are commonly said to contain several miles of continuous streets lined throughout with small booths opening directly upon the public way. — R. S.

BEACON TOWER. *A*. A tower intended to support a flaming beacon, that is to say, a means of alarm or warning.

B. In modern times, a towerlike structure intended to indicate a line of approach on entering a harbor, or to warn vessels of the location of a shoal or rock, or the like; often without any provision for a fire or other light.

BEAD. *A*. A convex rounded moulding, commonly of semicircular section. Hence, by extension,

B. A slender piece or member of wood or metal, having generally, wholly, or in part the section of a bead in sense *A*.

Angle Bead. A bead in either of the above senses, applied as a finish to an angle or corner. Specifically, a strip used in place of an Angle Staff (which see under Staff) as a protection to the salient angle of a plastered wall, to which it is secured under the plaster, the only visible portion being a projecting moulding forming a bead at the corner. By extension, a metal contrivance for the same purpose, but having no bead and arranged so as to be quite concealed by the plaster.

Centre Bead. A flush bead moulded at about the centre of a board, or the like.

Cock Bead. A bead moulded or applied so as to project beyond a surface or surfaces. It is *return-cocked* if it occurs on the angle or arris, and *quirked* if flanked by a groove on each side.

Corner Bead. Same as Angle Bead, especially in the specific sense as used in plastering.

Double Bead. Two beads side by side, there being no other surface or moulding between them.

Flush Bead. One worked in material so that its rounded outside is flush with the general surface.

Nosing Bead. A moulding, generally semicylindrical, on the edge of a board or the like, and occupying its entire thickness. Generally placed so as to project beyond an adjoining face, as at the juncture of a tread and riser of a staircase, where the moulded projection of the tread beyond the riser is the nosing.

Parting Bead. Same as Parting Strip, especially when small, and having in part the form of a bead in sense *A*.

Ploughed Bead. Same as Flush Bead.

Quirked Bead. A bead separated from an adjoining surface by a quirk or narrow groove along one or both sides, as is common in the case of a flush bead or the like.

Rail Bead. A cock bead when on a uniform, continuous surface, and not at an angle, reveal, or the like.

Rebate Bead. A bead in the reëntrant angle of a rebate.

Return Bead. A bead at the edge of a return, as along the edge of the salient corner of a wall. (Compare Angle Bead, above.)

Staff Bead. An angle staff of which the greater part forms a bead at the corner. (Compare Angle Bead, above.) — D. N. B. S.

BEAD AND BUTT. A method, and the result, of framing panels flush with the rails and stiles on all sides, each panel having the two longer edges, with the grain, worked into beads which butt against the rail or stile at the ends.

BEAD AND QUIRK. A bead set off by one or two quirks.

BEAD AND REEL. A convex rounded moulding representing a string of beads in which disks alternate, singly or in pairs, with oblong beads or "olives." This ornament, akin to the egg and dart in effect, is traceable to early Asiatic origins in Persia and Assyria. (See Astragal; Baguette.)

BEAD BUTT AND SQUARE. Similar to Bead and Butt; but having the panels flush on the beaded face only, and showing square reveals on the other.

BEAD BUTT WORK. Same as Bead and Butt.

BEAD FLUSH WORK. A method of framing panels to show a bead about the whole panel or planted upon it, the panel and bead flush with the frame.

BEAD HOUSE. Same as Bede House.

BEAK. Any ornament or moulding having a beaklike form or section; specifically, a small pendant moulding along the outer edge of the soffit of a cornice or similar member to form a drip. It may either project downward from the general surface, or be formed by a groove or channel cut behind it.

BEAK HEAD. An ornament occurring in the mouldings of some Norman buildings, and representing the head and beak of a bird.

BEAM. A piece or member of which the transverse dimensions are small relatively to its length; intended generally to be supported at two or more points to resist forces acting in a direction normal to its axis; but sometimes secured at one end only and sometimes acting as a member of a truss, in which case its purpose may be that of a strut; but always occupying a more or less horizontal position. By extension, however, the term is still used to designate any piece of a form intended primarily for the purpose described although put to another use: thus, a steel column may be constructed of channel beams, which would then be set on end. Beams of wood or stone are usually rectangular in cross section, or nearly so. Those of iron or steel have different cross sections, but are generally composed of a top and a bottom flange connected by a thin vertical web. The most common forms are the I Beam, the Channel Beam, the Z Beam, and the Deck or Bulb Beam. (See subtitles below.) Iron and steel beams are now (1900) rolled in one piece up to a depth of 2 feet. The larger sizes are made up of several pieces, and known as built beams and box beams. (See Box Beam and Built Beam below.) A large beam is frequently known as a Girder, irrespective of its use. — D. N. B. S.

Arched Beam. Any beam or similar member formed with an upward curve, whether of one piece bent or cut to the required curve, or whether made up of several parts secured together. A common form is the Laminated Arch (which see under Arch); which, however, acts by direct downward pressure upon its points of support and with little or no outward thrust.

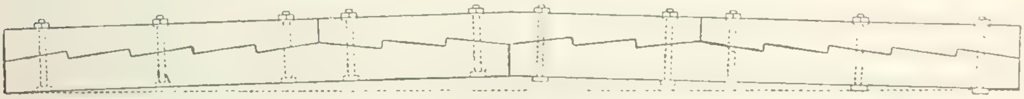
Binding Beam. In floor framing, the beam which supports the bridging beams (or floor beams) above and the ceiling beams below. (See Double Floor and Double Framed Floor, under Floor.)

Bowstring Beam. In British usage, a simple form of the bowstring truss.

Box Beam. An iron or steel beam, in shape like a long box with open ends, formed by two webs connected by top and bottom plates, or latticing. The webs may be either I Beams, Channel Beams, or Built Beams (see subtitles below) of plates and angles. Larger or more important ones are known as Box Girders.

Bridging Beam. A floor beam carried by girders or binding beams (see Binding Beam above) as distinguished from one which spans the whole space between bearing walls. (See Double Floor and Double Framed Floor under Floor.)

Built Beam. Any beam made up or built of several parts, as a Plate Beam (which see below), a Box Beam (which see above), or a wooden beam composed of Flitches.



BUILT BEAM.

This beam is formed by uniting five pieces of timber by scarfs and bolts. The beam is formed with a slight camber to avoid sagging. See illustration of Truss Beam.

Bulb Beam. An iron beam having a flange at one edge of the web and a nearly cylindrical rib or bar along the other edge; the name being given from the appearance of a section of the beam showing a cross piece at one end and a rounded expansion at the other.

Camber Beam. A beam to which has been given a slight camber or upward crowning in the centre for the purpose of counteracting any possible sagging in the future. The name is also applied in England to a beam whose upper surface is cut to a slight slope from the middle toward each end, as for nearly flat roofs.

Ceiling Beam. A light joist or beam set to receive the lathing for a plastered ceiling. In English practice the ceiling joists are mortised into the binding beams, or notched into their under edges and spiked. In American practice ceiling joists are seldom used except for false ceilings under fireproof floors, the ceiling laths being usually nailed either directly to the under edges of the floor joists, or to furring strips crossing the joists to whose under edges they are nailed. Their use has the advantage that heavy pressure or sudden blows upon the floor above will be less apt to injure the ceiling. Such ceilings are less apt to transmit sound.

Cellular Beam. The cellular beam or tubular bridge at one time in vogue for large bridges. It was a box beam large enough for trains to pass inside of the tube. The top, the compression member, and in a less degree the bottom, were made of cells formed by thin longitudinal partitions between their upper and lower plates. By this form of construction great stiffness and resistance to compression were obtained with a small quantity of metal. These bridges were, however, expensive to construct, difficult to repair, and remained in vogue only a short time. The Britannia Bridge in England and the Victoria Bridge at Montreal are two notable examples.

Channel Beam. A beam of iron or steel of such section that it resembles a gutter or channel. It consists of a vertical web with a flange at top and bottom on one side only. Those of the smaller dimensions are commonly known as Channel Bars or Channel Irons. (See Iron Construction.)

Collar Beam. A tie beam in a roof truss, connecting two opposite principal rafters at a level above the wall plate or foot of the truss; as, for example, in buildings whose upper story extends into the roof, the ceiling being carried by the collar beam. The collar beam is thus usually a tie taking the place of the more common tie beam. It might, however, become a strut if the horizontal thrusts of the rafters were otherwise overcome as in some forms of truss.

Common Beam. A beam to which the flooring is nailed, as distinguished from a bearing [illegible] ceiling joist. Common joists in American practice are 2 to 3 inches thick and 8 to 12 inches deep, according to the length of span. They are ordinarily set 16 inches on centres, or 12 inches for heavy or very strong floors.

Compound Beam. Same as Built Beam. (See subtitle above.)

Deck Beam. Any beam to support a deck; specifically, same as Bulb Beam. (See subtitle above.)

Dragging Beam; Dragon Beam. (See Dragging.)

Flitch Beam. (See under Flitch.)

Ground Beam. *A.* Same as Sleeper.

B. Same as Ground Plate.

Hammer Beam. In some kinds of framing, especially for steep roofs, a short beam securing the foot of the principal rafter to the brace, strut, or tie, and in a sense replacing the tie beam. The hammer beam is usually horizontal and forms part of at least two of the triangles of construction, namely, one above connected with the principal rafter, and the other below and connected with a wall piece. The object sought in replacing the tie beam by hammer beams is usually interior decorative effect.

Heading Beam. Same as Header.

I Beam. A beam whose section approaches the form of the capital letter I in the Roman alphabet, having a web which connects the upper and lower flanges at their centre lines. Those of the smaller dimensions are commonly called I Bars. (See Iron Construction.)

Joggle Beam. (See Joggle.)

Kerfed Beam. (See Kerf.)

Laced Beam. More often Lattice Beam (which see below).

Laminated Beam. Same as Flitch Beam.

Lattice Beam. A beam having its top and bottom flanges connected by diagonal members forming a lattice in place of a solid web; forming, in fact, a simple truss. The term is extended to include such members when constructed with what is more specifically known as Lacing.

Plate Beam. A beam or girder built with plates of rolled iron. It is used instead of standard rolled iron or steel I beams in cases where the local or structural conditions are such as to make the latter unavailable or insufficient for the service. Such beams are built with vertical plates called webs with angle bars riveted to them on both sides at top and bottom, forming flanges, and are further strengthened where necessary by one or more horizontal plates of the total width of the flanges at top and bottom. When, for greater strength, or to provide a width of top flange sufficient to permit a given wall or other superincumbent weight to be conveniently built or imposed thereon, two or three of such plate beams are used together, they are said to form a box beam or girder. Such girders are seldom made of greater span than 60 feet or of greater height than 5. The various forms of plate beams and girders are shown under Iron Construction.

Sandwich Beam. One made with a Flitch Plate.

Straining Beam. In a truss, a horizontal strut above the tie beam or above a line joining the feet of the rafters; especially, in a queen-post truss, the strut between the upper ends of the two queen-posts.

Strut Beam. In a trussed structure, a horizontal member acting as a strut; a straining beam or a collar beam.

Summer Beam. Same as Summer.

T Beam. A beam whose section approaches the form of the capital letter T in the Roman alphabet.

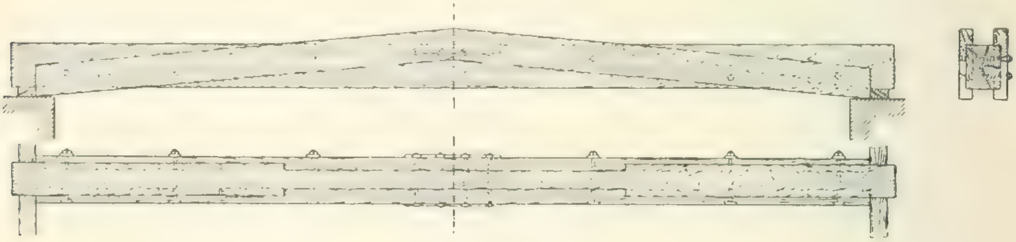
Tie Beam. (See Tie.)

Top Beam. Same as Collar Beam. (See subtitle above.)

Trimmer Beam; Trimming Beam. Same as Trimmer.

Truss Beam; -ed Beam. Any beam built up of members, as a truss. The term is, however, usually restricted to mean a simple beam which is strengthened by the addition of two or more subordinate members as by means of a bent tension rod secured to the two ends of the beam and connecting one or more vertical struts beneath its under side.

Z Beam. A beam whose section is nearly that of the letter Z of the Roman alphabet, having a web perpendicular to two flanges



TRUSSED BEAM.

The beam (in the centre) is stiffened by two pairs of struts, secured on either side by scarfing and by bolts; the beam itself acting as a tie. The whole acts as a simple truss and is a common form of Built Beam.

which it connects by their opposite edges. Those of the smaller dimensions are commonly called Z bars. — D. N. B. S.

BEAM FILLING. Masonry built in between the ends of beams where they rest in a wall.

BEARD. The sharp edge of a board. (C. D.)

BEARER. Any small subordinate horizontal member, generally one of a series, to support another member or structure, as one of several small beams to carry a gutter.

BEARING. *A.* That part of a lintel, beam, or similar horizontal weight-carrying member which rests upon a column, pier, or wall. Thus, it may be required that a beam of a certain size, and with a certain span, should have at each end an 8-inch bearing.

B. The whole length or span of a lintel, girder, or similar structure between the two points of support, that is the whole distance between the two bearings, in sense *A.*

Of these two meanings, the second is the one most often seen in untechnical writing, but in specifications and the like the word is more commonly limited to the signification *A*, and the word Span is used for the distance between the two points. — R. S.

BEARING (adj.). Supporting, sustaining. Said chiefly of a wall or partition as distinguished from those which merely enclose and do not support floors or the like.

BEARING PLATES. In pin-connected framing, reënforcing plates riveted to the web of a beam or a chord at a joint, to thicken the web and give greater bearing surface to the pin which connects the post or brace to the beam or chord. — W. R. H.

BEAUCE. (See Texier, Jean le.)

BEAUCHAMP, RICHARD; bishop and architect; d. 1481.

Beauchamp, Bishop of Hereford, and afterward of Salisbury, England, was made master and supervisor of the works of S. George's Chapel, Windsor. The designs for this building were probably made by him, or under his direction. After his death, Sir Reginald Bray (see Bray, Sir R.) succeeded to this office. Beauchamp built the great hall of his episcopal palace, and a handsome chapel at Salisbury Cathedral to contain his monument.

Britton, *Architectural Antiquities*; Britton, *Cathedral Antiquities.*

BEAUFILS, JACQUES; architect (*maçon*); b. 1487.

In 1505 he was associated with Pellevoisin (see Pellevoisin) in the superintendence of the construction of the cathedral of Bourges, France.

Lance, *Dictionnaire*; Bauchal, *Dictionnaire*.

BEAUJEU, JACQUES DE; architect.

He was *maître d'œuvre* (architect) of the cathedral of Lyons, France. In 1389 he built the portal of the Pont du Rhône at Lyons. Feb. 24, 1392, he contracted to build the great rose window of the façade of the cathedral.

Bégule-Guigue, *Monographie de la cathédrale de Lyon*; Bauchal, *Dictionnaire*.

BEAUJEU, JEAN DE: architect; d. 1568.

In 1547 Beaujeu succeeded Méric Boldoytre as architect of the cathedral of Auch (Gers France). He designed and built the western part of the church, especially the three main portals with the lower story of the porch. This work bears his signature, with the dates 1560 and 1567.

Canéto, *Sainte-Marie d'Auch*; Lance, *Dictionnaire.*

BEAUNEVEU (BEAUNEPVEU), ANDRÉ; sculptor, painter, and architect; d. before 1413.

Called *Faiseur des Thombes*, or tomb builder. A contemporary of Claux Sluter (see Sluter), and one of the greatest sculptors of the fourteenth century in France. He was formerly known only in a passage of Froissart's *Chronicle* describing painting and sculpture done by him about 1390 for the château of the Duc de Berry (b. 1340; d. 1416) at Mehun-sur-Yèvre. He is mentioned in the records as André de Valenciennes. Oct. 24, 1364, he was attached to the court of the king, Charles V.

Beauneveu directed the construction of the tombs of the kings Philippe VI. (d. 1350) and Jean II. (d. 1364) and that of Charles V. (d. 1380) himself, and his queen, Jeanne de Bourbon. These monuments have been destroyed, but much of the sculpture still remains at the church of S. Denis. It is remarkable for extreme realism and vigour of execution. The fine statue of Philippe VI. at the Louvre is probably by Beauneveu.

Gonse, *Sculpture française*; Deshaisnes, *Histoire de l'art dans la Flandre*; Delisle, *Cabinet des manuscrits*; Champeaux, *Dictionnaire des fondeurs*; Paul Leprieur, *Beauneveu* in *La Grande Encyclopédie.*

BEAUSSE. (See Texier, Jean le.)

BEAZLEY, SAMUEL; architect and dramatist; b. 1786; d. Oct. 12, 1851.

Samuel Beazley was a nephew of Charles Beazley, also an architect of note. In 1816 he rebuilt the Royal Lyceum Theatre, London. This building was destroyed by fire, and again rebuilt by him in 1831–1838. He remodelled Drury Lane Theatre, London, in 1822, and added the portico in 1831. Before Aug. 14, 1820, he rebuilt the Theatre Royal, Birmingham, retaining the façade designed by George Saunders in 1780. Beazley designed the Theatre Royal, Dublin, in 1821, the façade of the Adelphi Theatre, London, in 1841, the Soho Theatre, London, in 1834, the S. James Theatre, London, in 1836–1837, a theatre in Brazil, and another in Belgium. He made additions to the University of Bonn, Germany. He was a successful [illegible] and author.

Obituary in *Builder*, Vol. IX. (1851), p. 694; Britton and Pugin, *Illustrations of London.*

BEC, BERNARD DU. (See Bernard du Bec.)

BECCAFUMI (MECCHERINO), DOMENICO; painter, mosaicist, engraver, and sculptor; b. about 1486; d. 1551.

A painter of the Umbrian school, he was influenced especially by Raphael (see Santi, R.), Michelangelo (see Buonarroti), and Il Sodoma. He is best known by his superb compositions in the pavement of the cathedral of Siena, the cartoons for which are now in the academy of Siena, and certain studies at the *Ecole des Beaux Arts* in Paris. This great pavement, covering the entire floor of the cathedral of Siena, was begun about 1369, and was finished (by Beccafumi) in 1531. Among the many artists employed upon it, Paolo di Martino made the Moses (1426), Pietro di Minella the History of Absalom (1477), Benvenuto di Giovanni the Sacrifice of Jephthah (1485), and Antonio Federighi (see Federighi) four important compositions.

Müntz, *Renaissance;* Vasari, Milanesi ed.; Waring, *The Arts Connected with Architecture;* Sidney Colvin, *The History of a Pavement;* Didron Aîné, *Le dallage de la cathédrale de Sienne.*

BECERRA, GASPAR; architect, sculptor, and painter; b. (at Baeza, Spain) 1520; d. 1570.

Becerra spent a large part of his life in Rome, and assisted Vasari at the Cancelleria and elsewhere. He devoted himself to anatomy and the study of the works of Michelangelo and Raphael. Sometime after 1556 he returned to Spain, and was employed at Zaragoza and Valladolid. From Valladolid he was invited by Philip II. to Madrid, and decorated the Alcazar and the palace of the Pardo in that city. These decorations have been destroyed, and only a few of his pictures remain in the Museums. In 1569 he received a commission to design and build a tabernacle for the cathedral of Astorga (Leon, Spain). In 1563 he was appointed painter to the court.

Carl Justi, *Diego Velasquez;* Stirling-Maxwell, *Artists of Spain;* Bermudez, *Diccionario historico.*

BECHERER, FRIEDRICH; architect; b. 1747; d. 1823.

Becherer came to Potsdam, near Berlin, Prussia, as a boy, and was associated with Büring, Hildebrand, Manger, and Gontard (see Gontard) in the work of that place. In 1767 he went to Berlin and built the colonnade of the *Königsbrücke* from designs by Gontard. His most important independent work is the Alte Börse in Berlin.

Nicolai, *Beschreibung der Königlichen Residenzstädte Berlin und Potsdam; Allgemeine Deutsche Biographie.*

BECQUET, ROBERT; architect; d. 1554.

The old wooden spire of the cathedral of Rouen was burned in 1514. A new one was begun soon after by Martin Desperroys, *maître charpentier* of the cathedral. The work was long delayed, and at the death of Desperroys was assumed by his assistant, Robert Becquet. He was directed to present a new plan ("*pourtraict*"). The spire was completed in 1544. This splendid spire of wood upon a stone base was destroyed by lightning Sept. 15, 1822. It has been replaced by an iron structure designed by J. A. Alavoine (see Alavoine). Becquet executed the carpentry of the choir of the cathedral. He was a poet of ability, and in 1545 won the prize of the "Rose" on the *Concours des Palinods.*

Deville, *Les architectes de la cathédrale de Rouen;* Bauchal, *Dictionnaire.*

BED. *A.* The prepared soil or layer of cement or mortar on, or in, which a piece of material is laid, especially in masonry.

B. That face, more or less horizontal, of a stone, brick, or the like, which is in contact with a bed in the sense *A*, or prepared for that purpose, whether beneath or on top. Such faces are known respectively as the upper and lower bed. By extension, and where no mortar is used, the upper or under flat surface of a stone prepared for building. Also the under surface of a shingle, tile, or similar piece of roofing material.

Natural Bed; **Quarry Bed.** That face of a building stone which is approximately parallel with the strata or veins; the face or bed which is more or less readily formed when stone is shaped by splitting at the quarry. It is generally considered best, in masonry, to lay a stone on the quarry bed.

BED (v.). *A.* To give a bed to, as a stone.

B. To lay or set on a bed, as when a stone is said to be "well bedded," *i.e.* fixed solidly upon the substructure.

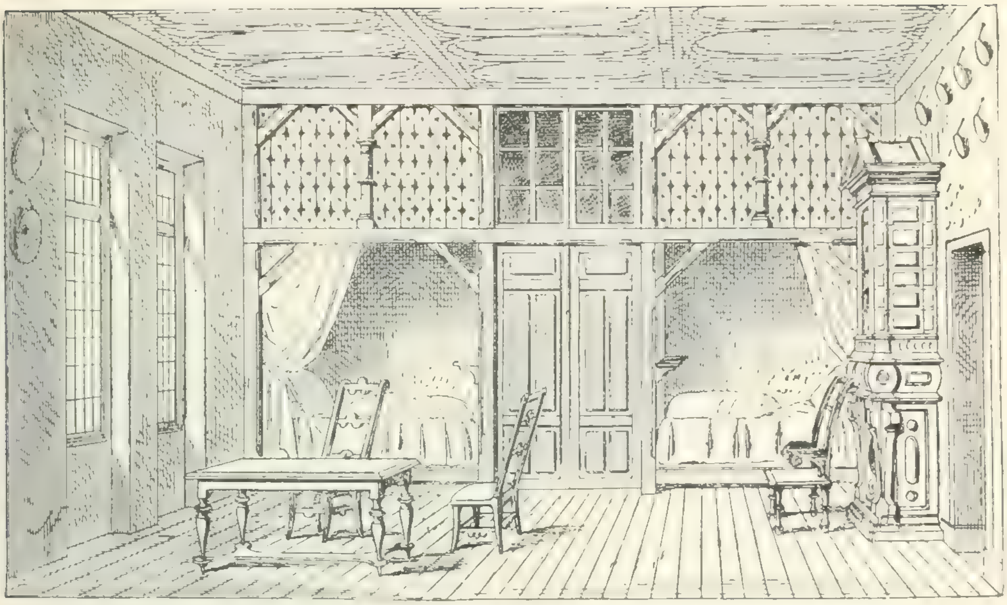
BEDCHAMBER. Same as Bedroom.

BEDEHOUSE. An almshouse where the prayers of the inmates were expected for the soul of the benefactor.

BEDFORD STONE. Bedford Oölite; a light-coloured oölitic limestone from Lawrence County, Indiana. One of the best of American limestones for general structural purposes.

—G. P. M.

BED PLACE. The space, when permanent, reserved for a bed, including all its fittings. The term "standing bed place" is often applied to a bunk on shipboard. In old houses, especially in the rural districts of Germany, of Scotland, and of other Northern countries of Europe, the bed place is an enclosed box with sliding or swinging door, or doors, forming a permanent fixture, generally built like a cabinet, of hard



Bed Places: Permanent: in Rich Peasant's House, Modern France.

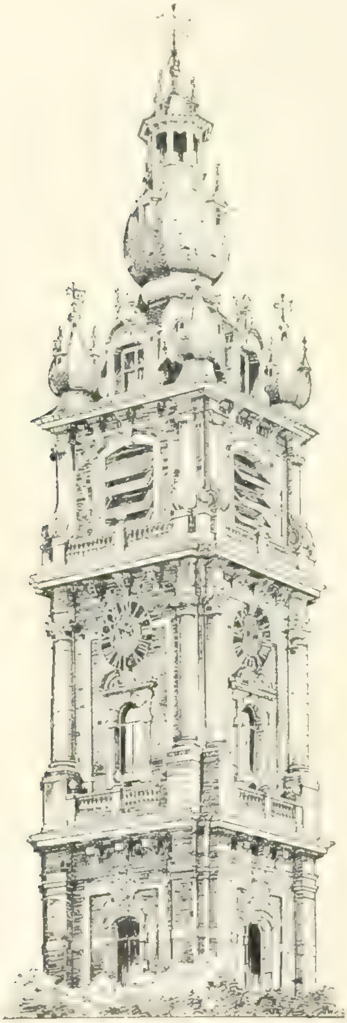
wood, and, in the better houses, made somewhat decorative.

BEDROOM. A sleeping room: a chamber designed to accommodate one or more beds and the necessary accompanying furniture.

The bedroom of antiquity is not fully understood, because the cubiculum of the Roman house, without windows, small, and evidently a mere sleeping closet, can hardly be supposed the sleeping room of a Roman patrician of the earlier time, and still less of a Roman noble of the Empire, or of the emperor himself and his great ministers. A bed or couch occupied by two persons can hardly be conceived of as placed in one of those cubicula. Luxury and splendour would have followed the Roman prince into his sleeping apartment as well as into his dining room; nor are there wanting passages in Martial and other writers which indicate the general truthfulness of this assumption. The bedrooms of the Greeks are even less understood, and it cannot be said that we know anything of the sleeping arrangements of the Asiatic and Egyptian of early time. In the early Middle Ages, the extreme rudeness of manners allowed of the sleeping of nearly all the members of a great household on the floor of a hall with such arrangement of straw and rushes as might be convenient, or in barns, outhouses, and the like; much as at the present day the negroes connected with a West Indian dwelling will sleep in the corridors and verandas, and can hardly be said to have bedrooms at all. The Bower and Solar were the means of giving some privacy to the family of the lord; and this single private room would be bedroom for two or even for more persons, and often the only sitting room which was separate from the general gathering place shared with servants and retainers. In a mediæval castle or town house we are not to look for separate bedrooms appropriated to others than the principal members of a family — at least, until the fifteenth century was well advanced. At about the beginning of the sixteenth century, the hall became less exclusively the place of gathering, and separate rooms were built often above the hall, which was then no longer a separate structure with open timber roof or vaulted.

The use of the bedroom as sitting room has left its mark upon the bedroom of the Continent of Europe, which is very commonly built with an alcove to contain the bed, which, with the necessary toilet apparatus, is thus separated and concealed during the day. The bedroom treated, as is common in England and America, as a room requiring especial care in its lighting, ventilating, and disposition, is very modern indeed, and the English dispositions have been largely copied on the Continent of Europe during the last half century.

A properly planned bedroom should have the doorway of entrance so placed and the door so hung that the bed itself shall not be immediately visible to a person entering the room. The placing of the windows, the fireplace, and the doors to closets or adjoining rooms will be a matter of choice with the occupant; but if the bedroom is to serve also for the dressing room for at least one person, the case is still more complicated, and the placing of the windows has much to do with the placing and proper lighting of the dressing table. In all these respects the bedroom with alcove has peculiar advantages, such as the frequent introduction of a vestibule corresponding with the depth of the alcove, and allowing the entrance door to be in a place which, least of all, commands a view of the bed. No general rule can be given for the planning of bedrooms of any form or size; the room which seems ideally good to one person has been found to be positively disliked by others of equal good taste and perceptions.



Beffroi: Mons, Belgium.

— R. S.

BEDSTEAD. The wooden or metal frame serving to support a bed and raise it above the floor, as to escape from draughts or the invasion of noxious animals. In modern usage, the bedstead is generally movable. (For a standing or permanent bedstead, see Bed Place; Berth; Box Bed; Bunk.)

BEEHIVE (n. used attributively). Conical, with curved sides, having a shape such as that of the tomb known as the Treasury of Atreus. (Compare Alveated.)

BEER CELLAR. *A.* A cellar for the storage of beer.

B. A drinking place (*Bier Stube* or *Kneipe*), usually partly underground and intended primarily for the sale and the drinking of beer. The idea is made attractive by association with the numerous *Rathskellers* of Germany (see Rathskeller).

BEFFROI. *A.* In French, a framework for supporting a heavy bell. Hence, —

B. In France and neighbouring countries, a communal or civil bell tower as distinguished from the *clocher* or steeple of a church. The *beffrois*, which first appear at the close of the twelfth century in France, are in some cases isolated, in others attached to the town hall. Those of the manufacturing towns of Belgium are particularly interesting. The name is applied also to a movable tower of wood used in sieges. (Compare Belfry; Bell Tower; Town Hall, under Hall.)

BEHAIM (or **BEHAM**); mason (*Steinmetz*); d. Aug. 27, 1538.

Hans Behaim built the *Kornhaus* at Nurnberg and the portal of the old *Rathhaus.* His son, Hans the Younger, succeeded him.

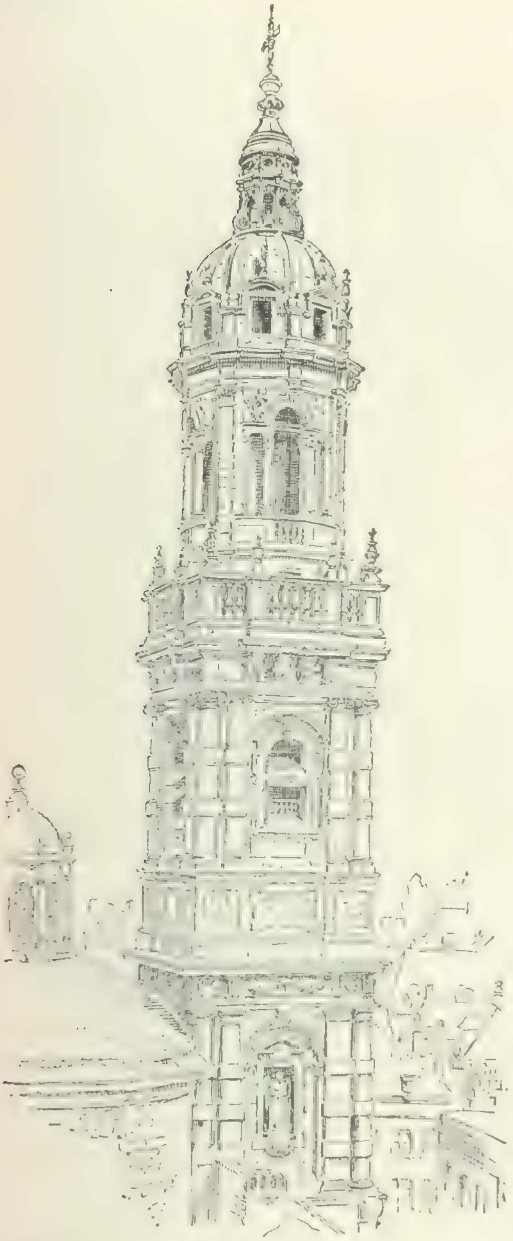
Neudorfer, *Künstler und Werkleute von Nürnberg.*

BELFRY. *A.* Originally, a tower, used in besieging a fortified place, of wood and movable. The term connected with *beffroi*, the French word of the same meaning, has no reference to bell. Later, a shelter for cattle, a watch tower, and the like; obsolete in all these senses. The form "belfraye" appears as early as the fifteenth century, though even then there is no reference to the use of bells.

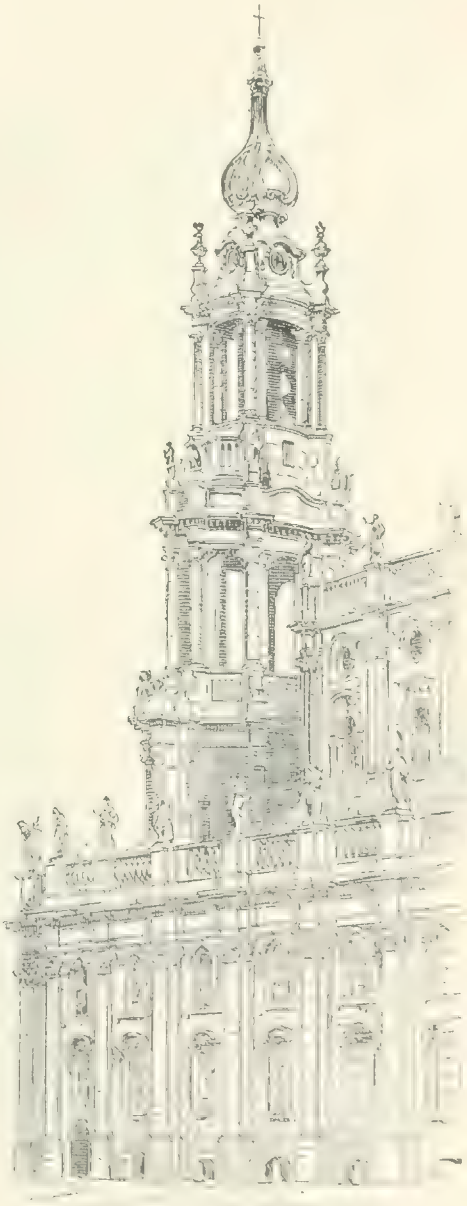
B. In modern use, a structure arranged for carrying large bells, and allowing of their proper service, in different applications, viz.: —

(1) A Bell Tower. (2) That chamber in a bell tower where the bells are placed, the Bell Chamber. (3) A Bell Cage. (4) The place occupied by the bell ringers. This is sometimes far below the bells, and in some churches is on the floor of the tower, level with the floor of the church itself. Holes in the vault above the porch may yet be seen in many churches, through which holes the bell ropes came down and were coiled and hung up on hooks in the walls when not in use.

Bells may be either struck by hammer on the outside of the soundbow or part where the metal is thickest near the mouth, or by the clapper at nearly the same point, in each case without moving the bell; or they may be swung so that the clapper strikes on the lower side of the soundbow only, or swung still further until the mouth is uppermost and the clapper strikes on both sides. It is only when bells are "swung" that they can properly be said to ring or to be rung. The striking of the bell while still by hammer or clapper is called chiming; although here there is confusion between the more regular and deliberately musical chiming and the technical expression here given. When the bell is not moved, the condition is nearly that of the Carillon. Various ingenious devices have been introduced for striking the bells in this way, and a great deal of inconvenience and great wear and strain upon the tower are saved by this means; but lovers of bell ringing adhere to the old practice, and to the belief that bells must be swung with their mouths uppermost and in peals of six or eight bells, managed by as many ringers acting in harmony under a leader, so as to give this kind of music its full interest and value. For the purpose of swinging bells an apparatus

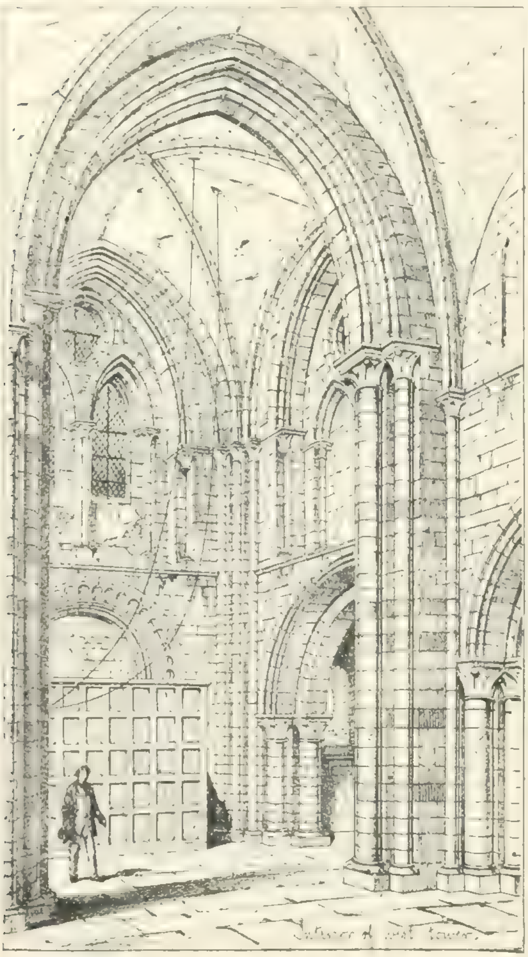


Belfry of Church of S. Charles Borromeo at Antwerp, c. 1620 A.D.



Belfry of the Catholic Court Church (Hofkirche), at Dresden.

is provided consisting of a "half wheel," or, in modern times, a wheel forming a complete circle, which wheel is secured to a "stock" or "head stock" at its axle, and consisting of a very solid short beam of wood supporting the bell and moving with the wheel. The bell is cast with what are called canons at the top, which canons form a kind of staple and allow of holding the bells by screw bolts closely to the stock. In some modern bells a mushroom-shaped button has been substituted. The rope is secured to one spoke or brace of the wheel and follows its grooved circumference for perhaps one quarter of the circle; it then falls through the floor of the bell chamber to the belfry in sense, *B*, (4). The pull of the rope turns the wheel, revolves the stock upon the pivot of the axle, and lifts the mouth of the bell. It is held by many antiquaries that the mediæval half wheel was better than the modern wheel, because the bell need never be swung above the horizontal line of the wheel's axis. In either case, the handling in this way of very heavy bells is extremely difficult; and the swinging of bells, even of ten hundred weight, requires very carefully adjusted apparatus kept in perfect order.


Interior of West tower.

Belfry: Interior of West Tower of Church at Bernieres, near Caen (Calvados).

The bell ropes pass through holes in the vaulting to the church floor.

(See Bibliographies of Church; Tower; Gothic Architecture; and the Geographical terms.)

— R. S.

BELFRY CHAMBER. Same as Belfry, *B*, (3).

BELFRY GABLE; BELFRY TOWER. Same as Bell Gable; Bell Tower.

BELFRY TURRET. *A*. Same as Bell Turret.

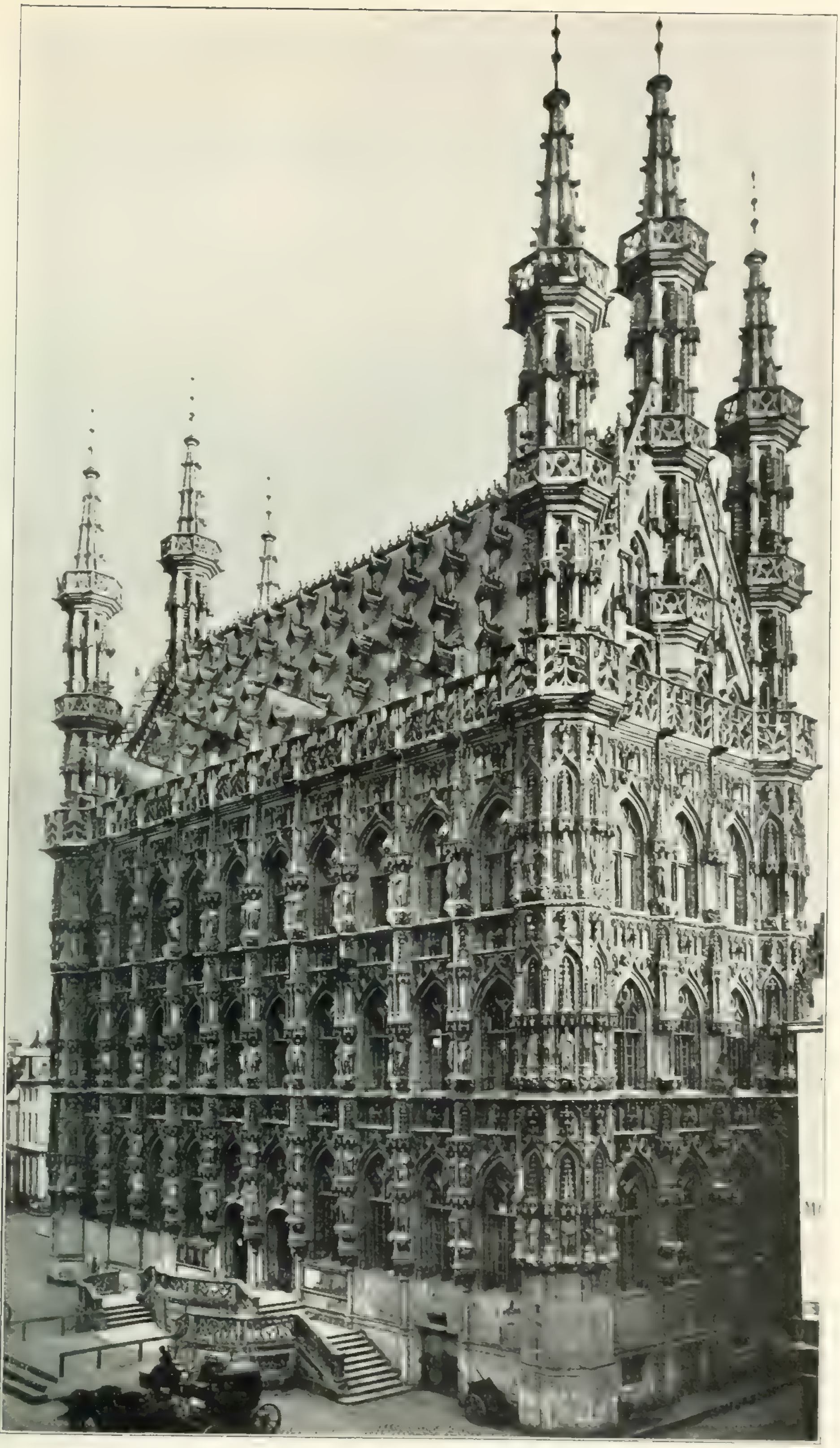
B. A turret leading to a belfry, as by means of a winding stair within the turret, and having often a separate door opening from the churchyard or the like.

BELGIUM, ARCHITECTURE OF. That of the modern kingdom, established in 1831 and including the ancient countships, bishoprics, etc., of Hainault, Namur, Brabant, Limburg, Hennegau, with the northern half of Flanders and the western half of Luxemburg.

The most important buildings of Belgium can be seen by following a route zigzagging irregularly across the country, taking the various cities in an order beginning with Antwerp on the north, and then successively through Mechlin, Louvain, Brussels, Alost, Audenarde, Ghent, Bruges, Ypres, Courtray, Tournay, Mons, Namur, Huy, and Liege. This embraces all of the architectural interest of the kingdom, with the exception of a few small examples which are in the suburbs of some of the larger cities.

The architecture of Belgium is essentially Germanic in spirit, the style of detail, the disposition and the character of buildings of all the periods showing the Teutonic origin of the people; though much of the mediæval work is inspired directly from France, while the Renaissance reflects the influence of the Spanish domination and the modern buildings are almost wholly French by derivation. The most characteristic phase of the national architecture is that afforded by its civic buildings, which are in many respects unrivalled anywhere in the world.

The earlier work is found mostly in the east and south towards the Rhenish provinces. At Soignies, twenty-two miles southwest of Brussels, is the church of S. Vincent, the oldest religious edifice existing in the country, dating from 965, and still retaining the complete features of a tenth century church. At Liege there are examples of Romanesque and early Gothic afforded by the churches of S. Croix, S. Barthelemy, S. Jean, and by the west front of S. Jacques. These churches show the peculiar arrangement



BELGIUM, ARCHITECTURE OF

Town Hall of Louvain; built between 1450 and 1465. The designer was Matthew of Layens. The building was restored early in the present century, but has suffered less in its general character than have many of the Gothic buildings of Belgium. The arrangement of the statues is curious, for the Dukes of Burgundy, Counts of Flanders, and other potentates are in the uppermost row, and in the lowermost row are the townsmen; the second tier of niches is filled with persons celebrated in the history of the country, warriors and statesmen. The corbels which support these statues are filled with very elaborate sculpture.

of the Rhenish Romanesque in which the west front becomes a mere frontispiece marked with two towers, without a central doorway, the main entrance being on the side. At Villers, twenty-five miles south of Louvain, not far from the site of the battle of Waterloo, are the imposing ruins of a Romanesqe abbey church dating from the early part of the thirteenth century.

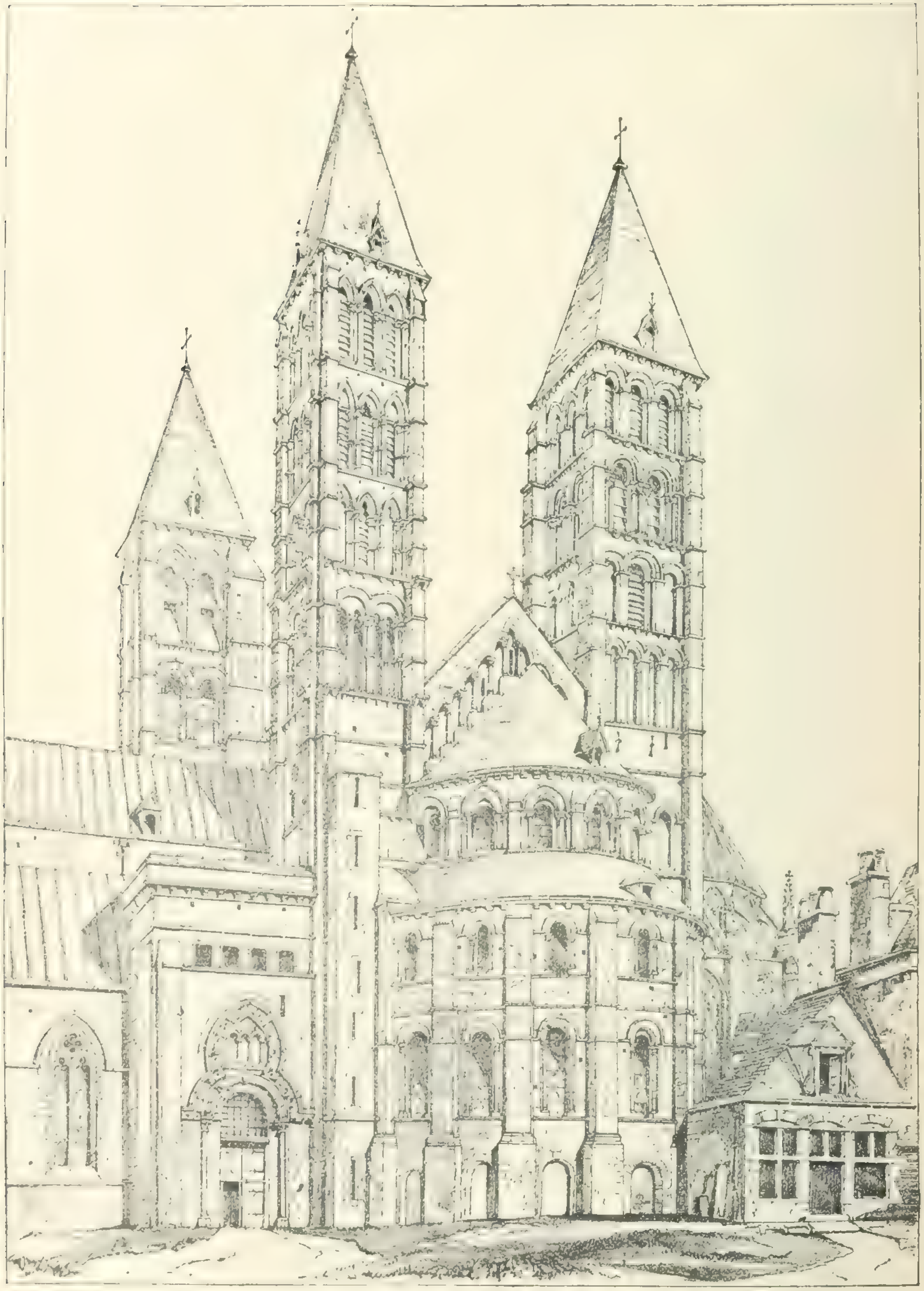
One of the early and very interesting buildings is the *Chapelle du Saint Sang* (Chapel of the Holy Blood), adjoining the town hall at Bruges, a two-storied structure dating from 1150 and showing a curious mixture of Oriental traces in its external architecture. The church of Notre Dame in the same city, dating in its present form from about the thirteenth century, has an interesting late Gothic north portal, giving access to the baptistery; and the cathedral of Bruges, dedicated to S. Sauveur, is an early Gothic brick structure, the oldest example of mediæval Flemish brickwork, with a nicely proportioned interior and a curious west tower, the lower part of which dates of the twelfth century, the upper portion being a nineteenth century addition.

The most notable example of the early work is afforded by the cathedral of Tournay, a very complete structure and of special interest in that it offers a complete epitome of the development of the Flemish Romanesque and Gothic styles. The nave, dating from 1066, is bold, round-arched Romanesque in style, with a double row of pier arches, slightly horseshoe in shape, a species of triforium and a clerestory. The carved capitals of the nave, two hundred or more, are remarkable for their beauty and variety. The original vaulting covers the side aisles, the present vaulting of the central aisle dating from 1777. The transepts are terminated by a circular Romanesque apsis treatment, the side portals being on one side of the transverse axis. The choir dates from 1338, is fully developed Gothic in style, and of construction so daring and slender that the original columns have had to be reënforced. The jubé dates from 1566. The exterior shows a square pyramidal roofed tower rising over the intersection, flanked by smaller square towers at the angles of the transept, and a modern west front preserving only the general lines of the Romanesque work. This is by far the best example of Flemish early mediæval work.

The cathedral of Liege has a handsome, very complete Gothic choir dating from 1280, with nave and additions of the early Renaissance period, 1528. There is also a very interesting Gothic church at Tongres, ten miles north of Liege, dating from 1240. The Romanesque cloisters of this church are worthy of note. At Lierre, a small town nine miles southeast from Antwerp, is the church of S. Gommaire, dating from 1445. The church of S. Martin, at Ypres, built about 1220, has been cited as one of the purest examples of thirteenth century Flemish Gothic, showing strong French influence. It has a large single tower on the west front over the portal, and an exterior treatment of flying buttresses on the sides, which is rare in Belgium. An extremely interesting church of the Gothic period is the cathedral of S. Rombaut, at Mechlin, the greater part of which dates from the fourteenth century, with choir of the fifteenth century and a huge west tower of the same period, carried to a height of 324 feet. Another noteworthy church is S. Pierre, at Louvain, dating from 1425, which is quite similar to S. Rombaut.

In Brussels there are only a few mediæval structures of any special note. Notre Dame de la Chapelle dates from the early part of the thirteenth century, the nave and west towers having been completed in 1483. The high altar, in a characteristic Rococo style, was executed from a design by Rubens. The church of Notre Dame des Victoires, dating from 1304, has been lately carefully restored. The only Gothic church in Brussels of any merit, however, is S. Gudule, the cathedral, an imposing structure begun in 1220 on the site of an earlier Romanesque chapel, traces of which remain in the choir. In a purely artistic sense the greatest treasure of the church is its stained glass, of an early Renaissance character, the best of which was painted by Bernard van Orley.

At Ghent there are three interesting examples of mediæval architecture. S. Jacques is said to have been founded in 1100, but the only early portion of the building remaining is possibly the towers, the remainder of the present edifice dating from a later period. The church of S. Michel is a Gothic structure of the early part of the fifteenth century, which has a striking exterior. The church of S. Nicholas is the oldest in Ghent, was founded in the tenth century, and is Romanesque in mass though it has been altered to such an extent in detail that it has lost its original character. There is an interesting treatment of the west front comprising a high gable almost entirely occupied by a broad window and flanked by two turrets; and over the intersection there is a tall, square tower of a type which suggests some of the Norman work, crowned by a pyramidal roof. This edifice in some respects is one of the most interesting of its kind, though less often commented upon than the cathedral church of S. Bavon in the same city, a building which could be perhaps considered as most truly the type of the Belgian Gothic. The west front is almost entirely occupied by an enormous tower, wider than the central aisle of the nave, carried up with square buttresses below, merging into corner turrets about the central octagon upon which the evident intention was to build a tall



BELGIUM: CATHEDRAL OF TOURNAY. VIEW OF SOUTH TRANSEPT spire. The interior is interesting for its simple, well-proportioned nave, but more particularly for the treasures of the early Flemish school of painters, especially the paintings in the choir by the brothers Van Eyck.

The style of the S. Bavon tower was developed in the Antwerp cathedral into a richness of design which marks one of the most interesting buildings in Europe. The main structure dates from 1352 to 1411, while the choir and the lower part of the towers were not completed until 1449, and the upper part of the north tower dates from the early part of the sixteenth century. In plan, the nave is seven-aisled, and the proportions are very impressive. It is undoubtedly the most dignified design as a whole that Belgian architecture ever produced. The west front includes two towers of which only one is completed, enclosing an elaborate portal and rose window. The completed tower is often compared in its delicacy of design to lace work, a simile which only indefinitely expresses the beautiful character of the work. In style it is very late Gothic with all the Flamboyant qualities which mark the Flemish work; but coming as this rich work does at the top of the tower it seems to grow naturally out of the relatively simple base.

The late Gothic church of S. Jacques, at Antwerp, dating from 1491, is the principal church in Antwerp after the cathedral.

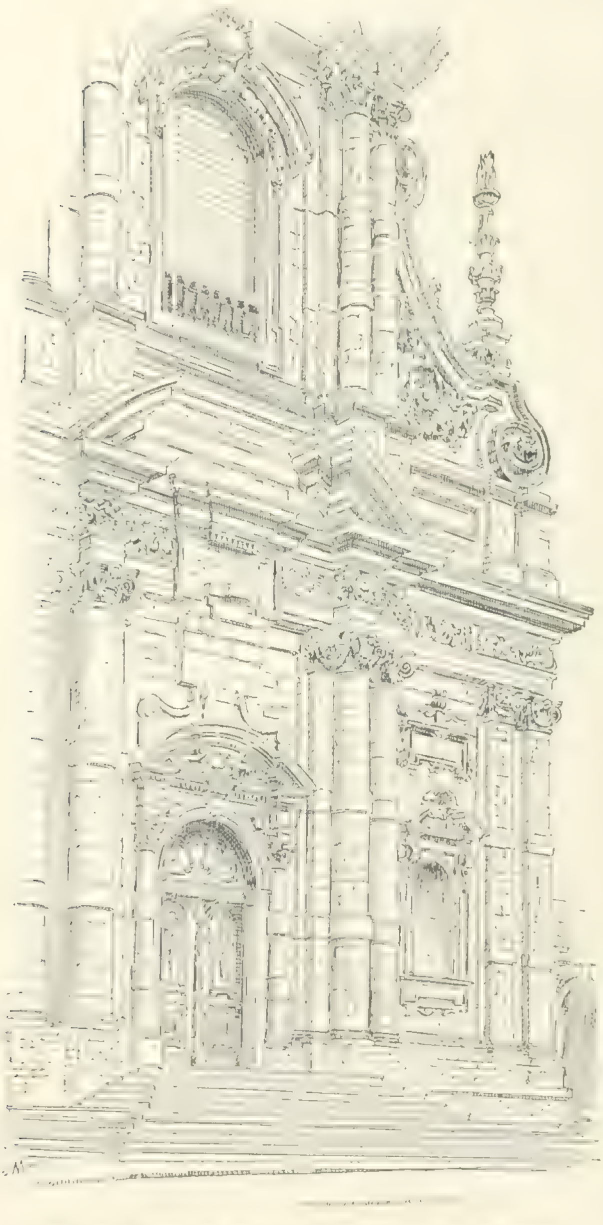
There remain of the mediæval period a number of lesser churches, all of which, however, are worthy of study. S. Waudru, at Mons, dating from 1450, is a late Gothic structure, the exterior of which is only partially completed, with a very bold interior construction. At Louvain, the church of S. Gertrude is a Flamboyant structure containing some elaborate choir stalls, considered the most notable of their kind in the country. At Tournay, the twelfth century church of S. Brice and the church of S. Quentin are both worthy of a visit. And then of lesser value are the churches of Notre Dame at Ypres, S. Martin at Hal, and S. Loup at Namur.

The Cloth Hall at Ypres, built about 1200, was the largest civic building erected in Europe during the thirteenth century, being over 400 feet long, of noble, striking proportion, the centre marked by a majestically designed tower. In its simple, dignified design, its size, and the purity of its detail it is probably the most successful building of its kind in Europe. The secular architecture of Belgium was, however, at its best during a later Gothic period, when the power of the Communes was at its height. The town hall of Bruges, built in 1376, is of relatively simple and quiet design, with very choice details, and is, perhaps, the purest example of Flemish civic architecture, though less interesting in mass and composition than the Brussels town hall, dating from 1401, which is marked at the centre by a very elaborate tower and a spire ranking in design with the north tower of Antwerp cathedral. The town hall of Louvain, erected in 1448–1463, is one of the most elaborately decorated pieces of Gothic architecture in existence, and is repeated on a similar scale with slight variations in the town hall at Audenarde. The town hall at Alost is a very picturesque treatment of the same problem; and that at Ghent is an elaborate structure on a smaller scale in a later Flamboyant style dating from 1481.

Nearly all the Belgian cities have their belfries and markets, many of which offer points of interest. The belfry at Bruges, erected at the end of the fourteenth century, is the best known and one of the most successful, consisting of an enormous tower attached to the markets, rising to a height of considerably over 300 feet. The belfry at Ghent, dating in part from the fourteenth century, is also of considerable interest, a rectangular tower crowned by a polygonal belfry in two stories. The thirteenth century bell tower at Tournay is very picturesque, and there are belfries of lesser architectural value at Mons, Courtray, Louvain, and Mechlin.

Of the Renaissance work there is not a great deal in Belgium. The Hôtel des Biscayas at Bruges, dating from 1495, is the earliest example. The bishop's palace at Liege, dating from 1508, is a structure often cited, a bastard early Renaissance design, in detail picturesque rather than architectural. The Palais de Justice of Bruges has a remarkable Renaissance chimney-piece dating from 1529, and in the same city, the Ancien Greffe or Court of Record is an interesting Renaissance edifice of 1534, recently restored. The modern Exchange at Antwerp is assumed to be in the same style as its predecessor, which was erected in 1531 and burned down during the present century, the only change having been made in the dimensions. The Antwerp town hall is an early Renaissance structure dating from 1554, the only one of the notable Flemish town halls which departs from the Flamboyant Gothic style. The Plantin Moretus mansion at Antwerp dates from the sixteenth century and is now used as a museum, preserved in many respects as it was when serving as a habitation. About the town hall at Antwerp are a number of guild houses dating from the sixteenth and seventeenth centuries, and all in excellent preservation. Similarly, there is a row of exceedingly interesting houses adjoining the town hall at Brussels. At Mechlin the Hotel du Grand Saumon is worth a visit. The late Flemish Renaissance and Rococo buildings of merit are few. The church of S. Charles Borromeo at Antwerp, built in 1620, cited as the handsomest Jesuit church in

Bruges, has an interesting tower; and the west front of the church of S. Michel at Louvain presents a most typical Jesuit design, dating from 1650. The late Renaissance and Rococo work is, however, chiefly exemplified in portions of, or additions to, earlier work. Several of the churches have some most elaborate Rococo interior details, such as the high altar of S. Rombaut, Mechlin, and the jubés of S. Waudru at Mons, and of Tournay cathedral. The Renaissance organ fronts also deserve study, notably those of S. Michel, Louvain, S. Jacques, Liège, and Notre Dame du Sablon, Brussels.



Belgium: Church of S. Michel, Louvain, Belgium, 1650–1660 A.D.

The nineteenth century work of Belgium compares favourably in many respects with that of other European countries. The most notable building is the Palais de Justice at Brussels, begun in 1866, and one of the largest architectural works of the present century. In dignity of composition and masterly handling of mass it is perhaps the most striking modern building of Europe. Also in Brussels is the Column of the Constitution, by the architect who designed the Palais de Justice, the Hôtel de la Banque, the Palais des Beaux Arts, and the Bourse, all of them in the modern French taste which seems to have found most favour in Belgium. There is a group of very interesting houses on the Boulevard du Nord, built as a result of a competition instituted by the municipality for the twenty best façades. Building No. 1 received the first prize.

There is a small history of the architecture of Belgium, published forty years ago, and too often quoted as if of authority. Otherwise, the subject is treated only in connection with larger fields of inquiry.

Van Ysendyck's great collection of plates (*Documents Classés de l'art dans les Pays bas*) contains a vast amount of material. Rudde, *Monuments de Bruges*, 1824; Verschelde, *The Ancient Domestic Edifices of Bruges*, 1875; Stappaert's *Belgique Monumentale*; Nash, *Architecture of the Middle Ages*, 1838; and plates and notes in miscellaneous works such as King's *Study Book of Mediæval Architecture and Art*; Gailhabaud, *Monuments*; Gailhabaud, *L'Architecture du V au XVII Siècle et les Arts qui en dépendent*.

— C. H. Blackall.

BELL. A hollow instrument, generally of metal, used to produce a musical sound when struck by a hammer, or the like. The usual form is that of an inverted cup, or bowl, with a flaring rim. Bells are of great antiquity, and were extensively employed by the ancients, — but not in connection with architecture, — merely as means of call, as instruments of music, as trophies, and for personal ornaments; the Christians, however, in using them in accordance with the requirements of their religion, were ultimately led to the invention of new forms in architecture, viz., the Campanile, Bell Tower, Belfry, Bell Turret, Bell Gable, and Bell Cot (which see). There is a tradition that church bells were invented by Paulinus, Bishop of Nola in Campania, about the year 400. They were in use in France as early as 550, and Saint Benedict introduced them into England in 680. The first church bells were made of wrought iron plates, lapping one over the other, and riveted at the point of juncture; a bell of this kind, made in the sixth century, is now in the church of S. Cecilia at Cologne. It is said that bells were cast in copper in the eighth century, but the oldest existing example bears the date 1159, and hangs in the campanile of the cathedral of Siena. Church bells, like all *instrumenta ecclesiastica*, are consecrated to their use by a regular form of benediction, and in this dedication rite each bell receives a name, a custom which, it is said, originated with Pope John XIII. (965–972). (For the placing and ringing of large bells, see Belfry.)

The celebrated bells of the world: —

Great Bell, Moscow	198 T.,	2 cwt.,	1 qrs.	0 lb.
Second Bell, Moscow	80 "	0 "	0 "	0 "
Third Bell, Moscow	57 "	1 "	1 "	16 "
Great Bell, Peking	53 "	11 "	1 "	20 "
Great Bell, Nanking	22 "	6 "	1 "	20 "
Bell Notre Dame, Paris	17 "	0 "	0 "	0 "
Bell of Erfurt, Erfurt	13 "	15 "	0 "	0 "
Big Ben, Westminster	13 "	10 "	3 "	15 "
Great Peter, York	10 "	15 "	0 "	0 "

The literature of bells is very voluminous; the older works on the subject are, Eggers, *De Origine et Nomine Campanarum*, Jena, 1684; Chrysander, *Hist. Nachricht von Kirchen-Glocken*, Rinteln, 1755; and the later ones, Gatty, *The Bell, its Origin, History, and Use*; Didron, *Annales Archéol.*, XVI., 325; XVI., 104; and many articles in the *Revue de l'art Chrétien*. There are books on the bells of almost every county in England, mostly historical, but of very little use to the architect; there are also a few remarks on the subject in Poole's *History of Ecclesiastical Architecture in England*.

Caryl Coleman.

Electric Bell. (See Electrical Appliances.)

BELLANO (VELLANO), BARTOLOMMEO; architect, sculptor, and goldsmith; b. about 1437; d. after 1491.

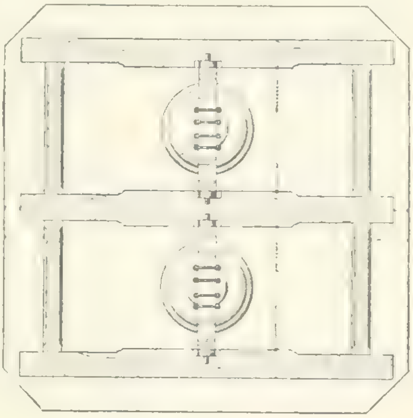
The principal pupil of Donatello in Padua. The monuments of Antonio Roselli (d. 1466), and Raffaele Folgoso in the church of S. Antonio at Padua (*il Santo*) are attributed to him. His will, dated Sept. 7, 1479, states that in that year he was sent to Constantinople with the painter, Gentile Bellini, by the Venetian Senate, at the invitation of the Sultan Mahomet II. In 1491 he began the monument of Pietro Roccabonella in the church of S. Francesco at Padua, finished by Andrea Briosco. (See Briosco.)

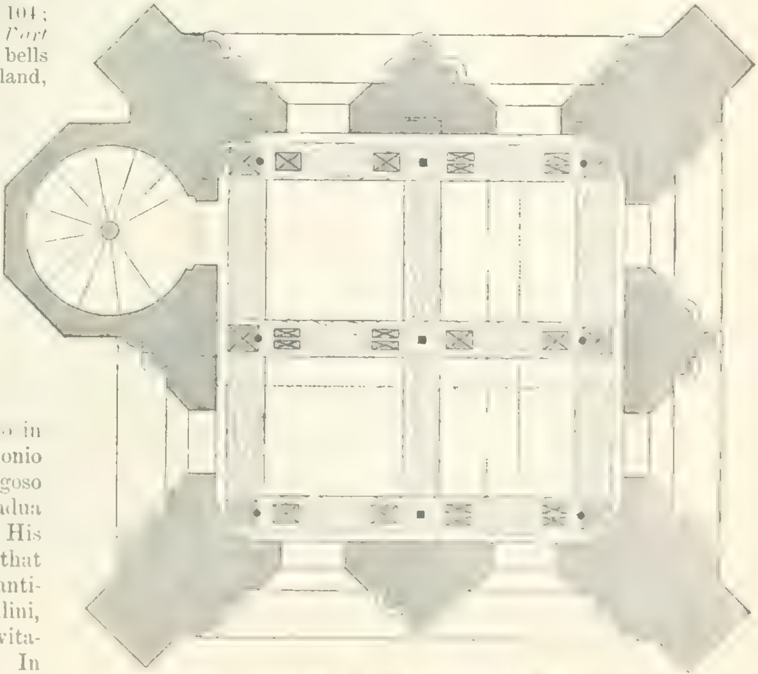
Bode, Wilhelm, *Lo Scultore Bartolommeo Bellano*; Paoletti, *Rinascimento in Venezia*, Vol. II.

BELL CAGE. The timber framework which supports the bells in a belfry or steeple. It is designed with the object of absorbing as much as possible of the vibration of the swinging bells, so as to transmit to the tower walls a minimum of jarring. (See Belfry, *B*; Bell Hanging.) (Cuts, cols. 283, 284, 285.)

BELL CANOPY. *A*. Same as Bell Gable.

B. An open structure with a small roof intended to carry and shelter a bell, and either standing independently, as at the gate of a

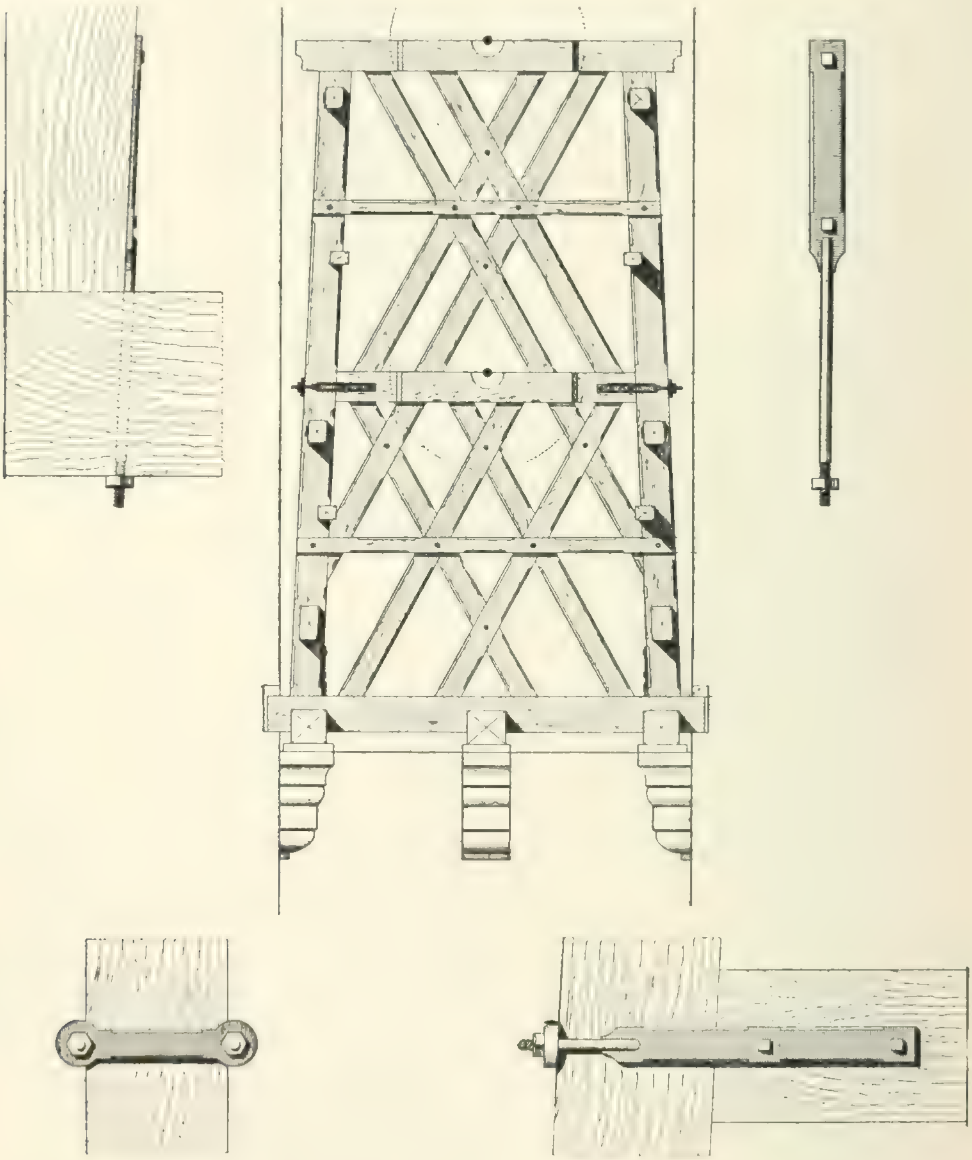




Bell Cage, Church of S. Jean Baptiste de Belleville.

churchyard, or resting upon the wall of a church, chapel, or other structure.

BELL CARRIAGE. The structure which carries a bell, or bells, in a belfry; either the whole Bell Cage, or the stock and wheel taken together, or the stock alone. The term does not seem to be used with technical accuracy.

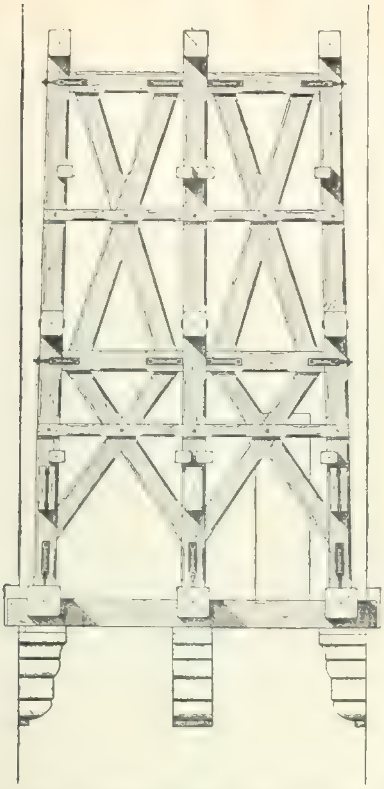


Bell Cage: Church of S. Jean Baptiste de Belleville.

BELL CHAMBER. That portion of the interior of a belfry, steeple, or campanile, in which the bells are hung. It contains the bell carriage, and has large openings to permit the wide diffusion of the sound. These openings are sometimes filled with Louver Boards, or Abat-Sons, to exclude the rain without interrupting the sound. (See Bell Carriage.)

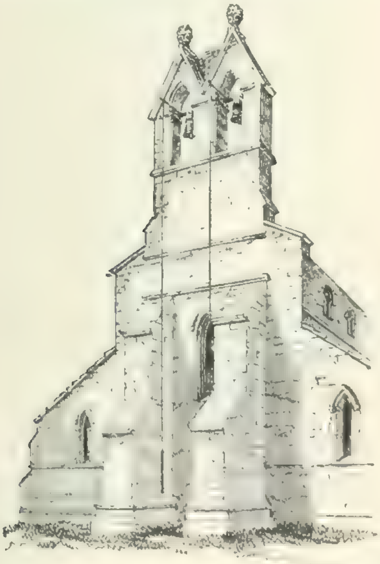
BELL COT; COTE. A small structure to carry and shelter one or more bells, and carried upon brackets projecting from a wall, or built upon a roof or spire. (Cut, col. 286.)

BELL CRANK. A bent or angular lever for changing the direction of a to-and-fro movement, so called from its use in changing the direction of bell wires of mechanical door bells or call bells.



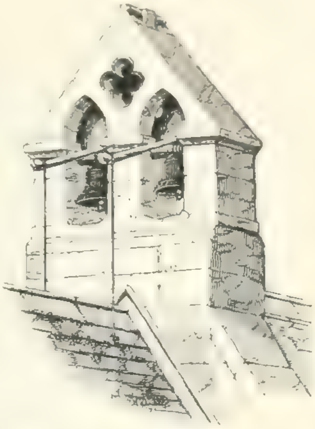
Bell Cage: Church of S. Jean Baptiste de Belleville.

BELL GABLE. A gable having an opening in which a bell is hung: in particular, an upward prolongation of a portion of a wall above the roof, terminating in a small gable, and having one or more openings for bells.



Bell Gable: Church of Little Casterton, Rutland.

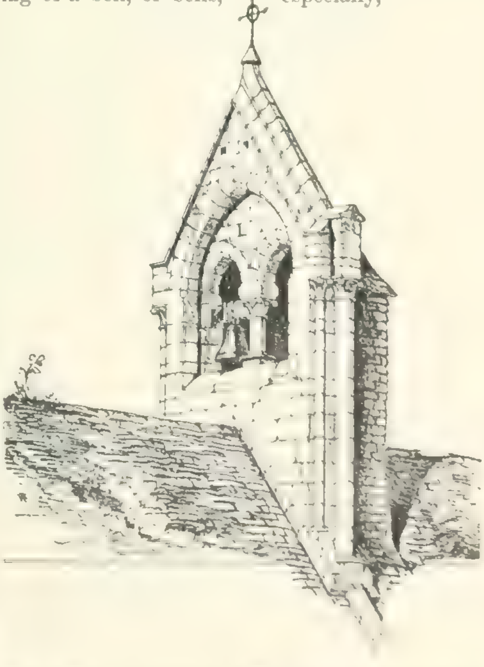
BELL HANGING. *A.* The trade or operation of putting in place in a building the bells and their appurtenances. Originally, this work was confined to such bells as were sounded by wires connected with levers or handles pulled by the operator, and other simple mechanical devices, and the trade of placing or hanging the apparatus was one requiring considerable skill and experience, owing to the necessity of nice and accurate adjustment of the long, strained wires which transmitted the power, changing direction where necessary by means of levers and bell cranks. In modern times, the trade also includes the placing of electric bells, which are, in fact, rapidly taking the place of the old appliances. (See Electrical Appliances.)



Bell Cote: Little Coxwell, Berkshire, c. 1200.

B. Same as Bell Carriage. — D. N. B. S.

BELL HOUSE. A building, usually towerlike, intended for the housing and proper sounding of a bell, or bells, especially, —



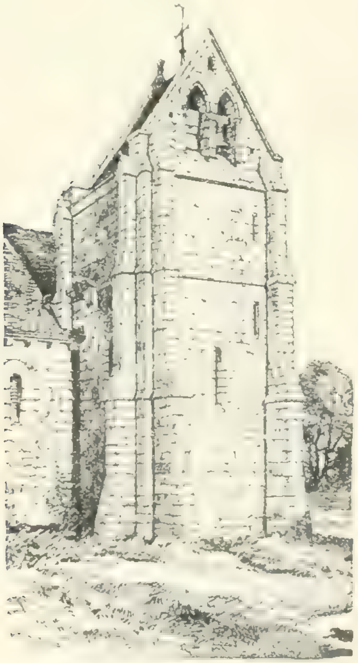
Bell Cote at Mittois, near Caen (Calvados).

[illegible]

A Round Tower, like those of Ireland, the term having been applied to these by modern archæologists because of the ancient Celtic term having that significance which is used for such buildings in early manuscripts.

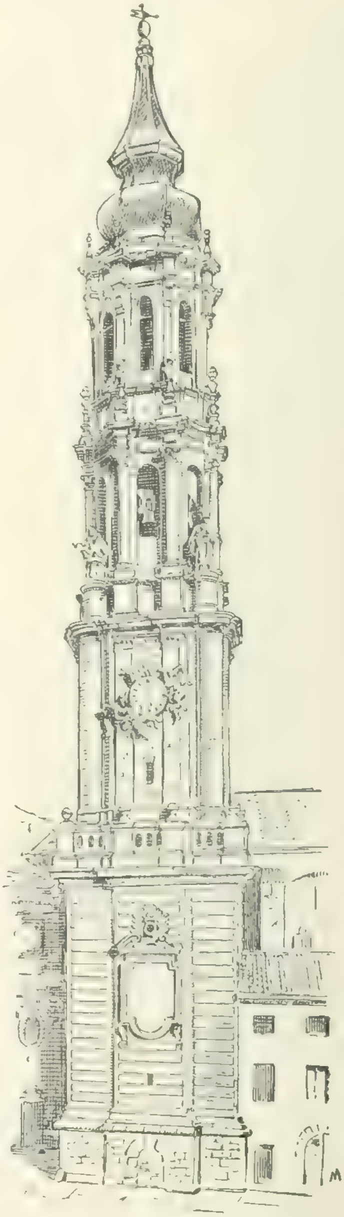
BELL PULL. A knob, or handle, and its appurtenances, connected with a bell by any mechanical contrivance, and by which the bell is rung by pulling.

BELL TOWER. A tower fitted and prepared for containing one or more large bells, and for allowing their sound to be heard properly near at hand, and also at a considerable distance. Nothing of the kind seems to have existed in antiquity. (For the earliest use of bells, see Bell.) Towers were erected in connection with churches; sometimes for defence (see Tower); sometimes as watch towers, in which case the municipality might join with the builders of the church in erecting a tower; the church itself serving, in early days, many of the purposes of a place of popular assembly. In any case, the obvious need of raising large bells well above the roofs of the church and other structures, and the superiority of the tower over the Bell Gable, or the like, as a means of support, would be obvious. The church towers of Italy took from the first, and have always retained, their character of isolated, or nearly isolated, plain vertical shafts. (See Campanile.) Those of the North were, from the first, more commonly designed as inseparable parts of the church building. In all, the same conditions obtained with regard to the placing of the bells, the openings of the bell chamber needing to be raised well above the ridges of the neighbouring roofs, and the bells placed with their mouths well above the sills of those openings.



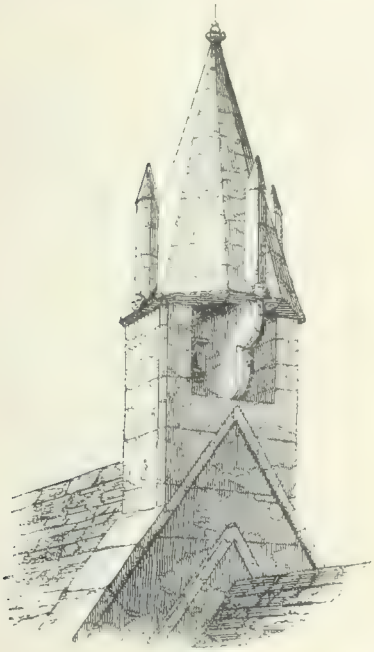
Bell Tower of the Simplest Form: Church at Tierceville, near Caen (Calvados), France.

The tower has a saddle-back roof.



Bell Tower of Old Cathedral at Zaragoza, Spain, c. 1685 A.D.

Municipal bell towers existed as early as the eleventh century, in Italy, and also in the North. They were at first used also as towers of defence, as in the case of disorders within the town. Later, they became ornamental features, usually attached to, or standing near, the Town Hall (which see under Hall), and the bell, or bells, served for alarms of fire, or of attack, and for calling the citizens together on any occasion. The chimes of bells, which are so attractive a feature in the historic towns of Belgium, were generally located in these municipal towers. (See Carillon and Chime.) It is noticeable that these towers would not have seemed to a citizen of Florence, or Brussels, in the fourteenth century, essentially bell towers; they have taken that association in modern times in consequence of the absence from our recent associations of any use for a tower apart from that of carrying bells. (Compare Beffroi; Belfry.) — R. S.



Bell Turret at Harescomb, Gloucestershire.

BELL TURRET. A small tower, usually topped with a spire or pinnacle, and containing one or more bells.

BELLY. A convex swelling portion of any surface, member, or piece, as the under side of a beam which has sagged; the rounded portion of a vase shaped baluster.

BELT COURSE. Same as String Course.

BELVEDERE. A building commanding or supposed to command an interesting view; but the name may be given to the whole of a large structure of which a part only is so favoured. Two buildings of special importance are known by this name: first, that in the Vatican, where a square court with the corners taken off, making an irregular octagon, is called the Court of the Belvedere, and the loggie and galleries which open upon it share in the appellation. Several important antique sculptures receive their common names from the fact of their standing in this part of the palace. Second, at Vienna, a palace in the immediate neighbourhood of the city; built in 1724 by Hildebrand for Prince Eugène of Savoy, and for many years containing the chief gallery of paintings belonging to the Austrian crown. These paintings have now been moved to the museum built upon the new *Ringstrasse*. — R. S.

BEMA. Originally, a raised platform; hence, the sanctuary of a Greek, Byzantine, or Armenian church, which is always raised one or more steps above the nave. In the Greek church the sanctuary is entirely screened from sight, leaving only a narrow strip of the platform visible in front. In the earlier churches it was left open, and contained seats for the clergy and sometimes for an episcopal throne in addition to the altar.

BENCH. *A.* A long seat, most often of wood, differing from a stool in its greater size and importance, and, frequently, in being fixed and in having a back and arms. Specifically, the seat for persons in some official capacity, especially in a court of justice, hence, —

B. The place occupied by such a bench; the room especially prepared for the placing of such a bench; a court of justice.

C. A narrow terrace or shelf in an earthwork or the like (see especially its use in Excavation).

BENCH MARK. A fixed reference mark from which heights and levels are reckoned in surveying or in laying out grounds and buildings. It is usually indicated by a notch or mark on a stone or stake firmly set at a given point of the plan.

BENCH TABLE. A projecting benchlike course of masonry on the inside of a church, near the floor; it corresponds to the Water Table on the outside.

BENCI, ANTONIO DI JACOPO (ANTONIO DEL POLLAJUOLO); sculptor and painter; b. 1429; d. 1498.

Known more as a painter and anatomical draughtsman of celebrity than as a decorative artist; but there is embossed work of his in the baptistery of Florence.

Bode, *Italienische Bildhauer der Renaissance*; Müntz, *Renaissance*; Perkins, *Tuscan Sculptors*; Vasari.

BENCI DI CIONE of Como; architect; d. 1388.

About 1350 Cione built the Capella di S. Anna at Or S. Michele in Florence. He was associated with Francesco Talenti (see Talenti, F.) at the Duomo, and with Simone Talenti (see Talenti, S.) as *capomaestro* of the Duomo and Loggia dei Lanzi.

Frey, *Loggia dei Lanzi*; [illegible], *Or San Michele*.

BENDING MOMENT. (See under Moment.)

BENEDETTO DA MAIANO: sculptor and architect; b. 1442; d. May 24, 1497.

A younger brother of Giuliano da Maiano (see Giuliano da Maiano) and, according to Perkins, a pupil of Luca della Robbia (see Robbia, L. della) in sculpture. Benedetto was associated with Giuliano in their *botega* (atelier) in Florence, and the architectural portion of the works attributed to him probably belongs to Giuliano. He made the altar of S. Savino in the cathedral of Faenza about 1471 (Bode). Before 1481 he made the marble doorway at the Palazzo Vecchio, Florence. His sculpture at Loreto, including the fountain of the sanctuary, dates from 1484–1487 (Gianuizzi). For Pietro Mellini he made the fine pulpit in the church of S. Croce, Florence. About 1488 he appears to have visited the court of Matthias Corvinus, king of Hungary. Benedetto's reputation as an architect rests mainly upon the assertion of Vasari that he designed and built the first story of the Palazzo Strozzi in Florence (begun 1489). The documents indicate, however, that Giuliano da Sangallo was the actual designer of the building (see Sangallo, Giuliano da). The extremely delicate portico of the church of the Madonna delle Grazie at Arezzo is ascribed to Benedetto by Vasari. About 1490 he made the bust of Antonio Squarcialupi in the Florentine cathedral. After the death of Giuliano da Maiano in 1490, Benedetto entered the service of Alfonso, Duke of Calabria, afterwards King Alfonso II., for whom he made, in the church of Mont Olivetto, Naples, a retable with a bas-relief of the Annunciation and other works. The black marble monument of Filippo Strozzi in the church of S. Maria Novella, Florence, was made by him about 1493. Probably after this date, he made, at San Gimignano, near Florence, the altar of S. Fina in the Duomo, and the altar of S. Bartolo at the church of S. Agostino.

Müntz, *Renaissance*, Vol. II., pp. 400 and 482; Vasari, Milanesi ed., Vol. III., p. 333; Bode, *It. Bildhauer der Renaissance*; Giannuzzi, *Benedetto da Maiano* in *Archivio Storico dell' Arte*, Vol. I. .

BENEDETTO DA ROVEZZANO (GUARINI or **GUALOTTI)**; architect and sculptor; b. 1478; d. after 1552.

Benedetto is especially known as an ornamentist. His best preserved work is the fireplace of the Palazzo Rosselli del Turco now in the Museo Nazionale, Florence. He designed the monument of the Gonfaloniere Piero Soderini in the church of the Carmine, Florence, and that of Oddo Altoviti in the church of SS. Apostoli, Florence. In 1524 he went to England and made for Cardinal Wolsey the sarcophagus which was finally used for the tomb of Admiral Nelson in S. Paul's cathedral, London.

Hans Stegmann in Geymüller-Stegmann, *Die Architektur der Renaissance in Toscana*; H. Semper, *Hervorragende Bildhauerarchitekten der Renaissance.*

BENEDIKT (BENESCH); architect; d. 1537.

Benesch, an architect of Laun, Bohemia, built for Wladislaw II., king of Bohemia (d. 1516), the *Residenz* on the *Hradschin* in Prague. One wing of this palace with the great vaulted hall, *Krönungssaal*, his most important work, is still in existence. He built also the church of S. Barbara at Kuttenberg near Laun. Benesch was essentially a constructor, building on Gothic lines. In the decoration of his buildings, Renaissance details appear.

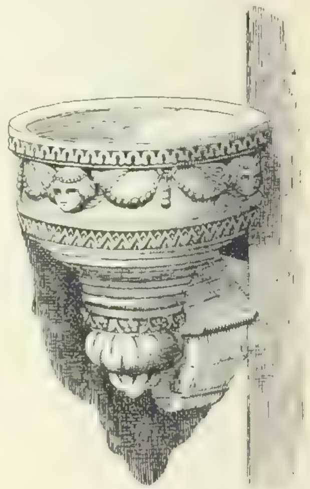
Lübke, *Geschichte der Renaissance in Deutschland.*

BENESCH. (See Benedikt.)

BÉNEZET (BENOÎT), SAINT; architect and engineer, "*patron des ingénieurs.*"

According to the Chronicle of Frère Robert d'Auxerre, Benoît came to Avignon in 1177, *Se disant envoyé de Dieu pour construire un pont sur le Rhône.* He collected the necessary money as alms in various parts of France, and built the bridge of Avignon in the style of the Pont du Gard, built by Hadrian in the second century A.D. near Nîmes, France. Of his structure only the chapel, in which he is buried, and portions of the piers remain. The rest has been rebuilt at different periods. He founded the order of *frères pontifes* who built many mediaeval bridges in France.

Massillon-Rouvet, *Le pont d'Avignon*; De Giradot, *Des ponts au XIII siècle.*



BENITIER: CHURCH OF S. MARK, VENICE. EARLY CINQUECENTO WORK.

BÉNITIER. In French, a holy water basin, usually set at the entrance to a church. The bénitier may be supported on a shaft or pedestal, or corbelled out from the wall. (Compare Pila; Stoup.)

BENJAMIN, ASHER; architect.

He published *Town and Country Builder's Assistant* (1797), *The Practical House Carpenter* (4th ed., 1835) and *Elements of Architecture*, books much used by early American architects. He built numerous residences in western Massachusetts.

American Architect, Vol. XLVII., p. 40.

BENOÎT. (See Bénezet.)

BENT (n.). In the United States, a part of a framed structure consisting of two opposite posts or nearly upright struts connected by a beam or by braces. In former times it was constructed on the ground and then raised to its position.

BENVENUTO DI GIOVANNI. (See Beccafumi, Domenico.)

BÉRAIN, JEAN; decorator, painter, and engraver; b. 1638 or 1639, at Saint Mihiel, France; d. Jan. 24, 1711.

He was probably a pupil of Gissey, whom he succeeded in 1674 as *dessinateur du cabinet du roi*. He was the chief assistant of Charles Lebrun (see Lebrun), and executed under his direction the decoration of the *Galerie d'Apollon* at the Louvre, and of the châteaux of Versailles, Saint Germain, Sceaux, etc. He also designed tapestries at the Gobelins. At the death of Lebrun, in 1690, Bérain succeeded him in much of the decoration of the royal palaces. In 1677 he was granted lodgings in the Louvre, where he died. As an engraver he first appears in the illustration of *Diverses pièces de serrurerie inventées par Hugues Brisville* (see Brisville), Paris, 1663, 4to. The *Œuvres de J. Bérain contenant des ornements d'architecture* was published in 1711 (Paris, folio). A reprint, *100 planches principales de l'œuvre complet de Jean Bérain*, has been published by Quentin. His brother, Claude Bérain, was an engraver of note, and his son Jean succeeded him in his work.

Valabrègue, "Jean Berain" in *Revue des Arts Déc.*, Vol. VI.; Mariette, *Abecedario*; Genevay, *Style Louis XIV*; Guilmard, *Les Maîtres ornementistes*.

BERCKMANS, FERDINAND; architect; b. Aug. 3, 1808.

In 1834 Berckmans was appointed architect of the province of Antwerp, Belgium, and in 1841 professor at the Académie in that city. In 1838 he made a tour through the principal countries of Europe. Berckmans designed various monuments, and built the *Gemeenehuis* in the Gothic style at Duffel, Belgium.

Immerzeel, *Hollandsche en Vlaamsche Kunstenaars*.

BERE, RICHARD; abbot and architect; d. Jan. 20, 1584.

Bere was installed as Abbot of Glastonbury, Somerset, England, in 1493. He built King Edgar's chapel at the eastern end of the church of that abbey, which was finished by Abbot Whiting. Bere strengthened with arches both sides of the east end of the abbey, which was beginning to "cast out." In 1503 he was sent on an embassy to Rome, and on his return built a chapel to Our Lady of Loretto on the north side of the abbey church. He built also the Chapel of the Sepulchre in the south aisle, in which he was buried. His initials and cognizance, a cross between two beer mugs, may be seen in S. Benedict's church in Glastonbury.

Leland, *Itinerary*; Willis, *Architectural History of Glastonbury Cathedral*; Leslie Stephen, *Dictionary of National Biography*.

BEREA GRIT. Berea sandstone; a fine-grained, light-coloured sandstone from the Berea grit (Waverly) formations in Ohio. Much used for building. — G. P. M.

BERHAM, HELYAS DE. (See Elias de Derham.)

BERNABEI. (See Domenico da Cortona.)

BERNARD DE SOISSONS; architect; d. about 1382.

The name of Bernard de Soissons was inscribed with those of Gauthier de Reims, Jean d'Orbais, and Jean Loup in the labyrinth (mosaic pavement) of the cathedral of Rheims. They are supposed to have been architects of the church in the fourteenth century. The labyrinth itself has disappeared.

Gonse, *L'Art gothique*; Joanne, *Itinéraire, Champagne et l'Ardenne*; Cerf, *Cathédrale de Reims*.

BERNARD DU BEC.

A monk of the Abbey of Bec who was abbot of the monastery of Mont Saint Michel, Manche, France, from 1139 to 1149. At Mont Saint Michel he finished the nave of the church and built the tower and the two transepts with their semicircular chapels. His choir was destroyed in 1421. He built a Church of the Virgin on the rock of Tombelaine near Mont Saint Michel.

Corroyer, *L'Abbaye du Mont Saint Michel*.

BERNARDO DA VENEZIA; architect and sculptor.

He is described as *tagliatore e magistro a lignamine*, and was the favourite architect of Gian Galeazzo Sforza (d. 1402), Duke of Milan. Bernardo was the first architect of the Certosa at Pavia, his name appearing in a document dated a month before the first stone of that building was laid (Aug. 27, 1396). He was frequently consulted during the construction of the cathedral of Milan (begun at the close of 1396). He built the castle of Pavia and the church of the Madonna del Carmine in Milan (1400).

Calvi, [illegible]; Boito, [illegible] *di Pavia*.

BERNARDO DI LORENZO, of Florence; architect.

An important architect, *muratore*, who appears frequently in the accounts of the buildings of Nicholas V. (Pope, 1447–1455) and Pius II. (Pope, 1458–1464) in Rome. He was admitted to the guild of stonecutters (*Arte dei Maestri di Pietra*) in 1447, and first appears in the pontifical records of Nicholas V., Dec. 31, 1451. He is easily [illegible]

Bernardo Rossellino (see Gambarelli, B.), as they both appear under the same name, *Bernardus Florentinus*.

Müntz, *Les arts à la cour des papes*; Milanesi, *Sulla Storia dell' Arte Toscana*.

BERNEVAL, ALEXANDRE DE; architect; d. 1440.

The third, and one of the chief, architects of the church of S. Ouen at Rouen. His tomb at S. Ouen bears the date 1440. Alexandre built the southern portal and its rose window. He was succeeded by his son, Colin de Berneval (see Berneval, Colin de).

De Jolimont, *Les principaux édifices de Rouen*.

BERNEVAL, COLIN DE; architect.

A son of Alexandre de Berneval (see Berneval, A. de), who, in 1440, succeeded his father as architect of the church of S. Ouen at Rouen. His effigy on the Berneval tomb in S. Ouen holds a tablet inscribed with a plan of the nave and main portal of the church, and indicates the portions with which he was mainly occupied.

De Jolimont, *Les principaux édifices de Rouen*.

BERNINI, GIOVANNI LORENZO; sculptor and architect; b. Dec. 7, 1598; d. Nov. 28, 1680.

Bernini was the son of a Tuscan sculptor, working in Naples. His talent developed early. While still a youth, he made the beautiful group of "Apollo and Daphne" at the Villa Borghese, Rome, and the "Rape of Proserpina" at the Villa Ludovisi. In the reign of Urban VIII. (Pope, 1623–1644) he made his earliest important work of architecture, the Baldacchino of S. Peter's in Rome. After the death of Carlo Maderna in 1629, Bernini succeeded him as architect of S. Peter's (see Maderna, C.). He continued the construction of the Palazzo Barberini, Rome, begun by Maderna. The façade and the staircase are ascribed to him. In 1642 he began the monument of Urban VIII. at S. Peter's. During the reign of Innocent X. (Pope, 1644–1655), Bernini appears to have suffered from the intrigues of his pupil Boromini (see Boromini), who superseded him as architect of S. Peter's. At this time he built the Capella Cornaro at the church of S. Maria della Vittoria, Rome, and the fountains of the Piazza Navona, of the Piazza Barberini, and of the Piazza di Spagna, Rome. Bernini's most appreciative patron was Alexander VII. (Pope, 1655–1667), who made him *architetto alla camera apostolica*, a position which he held for the rest of his life. For him he built his most famous work, and one of the most successful monuments of modern architecture, the great colonnade of the Piazza of S. Peter's, Rome, and the Scala Regia at the Vatican. Bernini built the Palazzo Ludovisi and many other public and private buildings in Rome. He was requested by Colbert to make designs for the completion of the Louvre, and by letter of Louis XIV., dated April 11, 1665, was invited to Paris. Bernini was treated like a prince in France, but his design for the Louvre being inferior to that of Claude Perrault (see Perrault, Claude) it was not executed, and he returned to Rome in the autumn. He made the monument of Pope Alexander VII. in S. Peter's.

Dohme, *Lorenzo Bernini*; Milizia, *Memorie*; Falda, *Le Fontane di Roma*; Letarouilly, *Le Vatican*.

BERNWARD; bishop, painter, and architect; d. 1022.

Bernward was from 993 to 1022 Bishop of Hildesheim (Rhenish Prussia), and is credited with the erection of the *Michaelis kloster* and the *Kapelle des heiligen Kreuzes* at Hildesheim. He was also painter and metal worker, and had great influence upon the artistic development of his time.

Allgemeine Deutsche Biographie; Schultz, *Bernward*, in Dohme Series.

BERRETINI, PIETRO (PIETRO DA CORTONA); painter, decorator, and architect; b. (at Cortona) 1596; d. 1669.

He is best known by his work as a decorator, which is to be found in Rome, Florence, and many other Italian cities. To him is largely due the fully developed style of the late Renaissance. His most important works are the decoration of the great hall of the Palazzo Barberini, Rome, and of the galleries of the Pitti Palace, Florence. He also decorated the Chiesa Nuova, built the altar of S. Xaverius in Vignola's church of the Gesù, and decorated the church of S. Carlo al Corso, all in Rome. Examples of his purely architectural work are the church of SS. Luca e Martina in Rome, the beautiful façade of the church of S. Maria della Pace, Rome, before 1659. The façade of S. Maria in Via Lata, Rome, was built from his designs about 1680. Many of his drawings are in the Uffizi.

Gurlitt, *Geschichte des Barockstiles in Italien*; Ebe, *Spät-Renaissance*; Strack, *Baudenkmäler Roms*.

BERRUGUETE, ALONSO; sculptor, painter, and architect; b. 1480; d. 1561.

Alonso was the son of Pedro Berruguete, a Spanish painter, who flourished in Castile toward the end of the fifteenth century. He studied with his father, and as early as 1503 was in Florence. Berruguete was one of the young men who formed themselves on Michelangelo's cartoon of "Soldiers Bathing," and appears to have been employed by Michelangelo (see Buonarroti) at the Vatican. He returned to Spain in 1520. Berruguete lived for some time at Zaragoza, and in 1526 established himself at Valladolid. Between 1526 and 1532 he made the great wooden retable of the convent of S. Benedict in that city. About the same time he executed the marble monument of Alonzo de Burgos, confessor of Queen Isabella the Catholic, in the chapel of the College of S. Gregorio at Valladolid (now destroyed). The Emperor Charles V. made Berruguete painter and sculptor of the "Camara," and intrusted him with the decoration of his projected palace at the Alhambra. He was employed at the Alcazar and Episcopal Palace at Toledo. Berruguete died while engaged upon the fine monument of the Cardinal Talavera at the Hospital de Afuera at Toledo.

Bermudez, *Diccionario historico*; Viñaza, *Addiciones al Diccionario historico*; Stirling-Maxwell, *Annals of the Artists of Spain*; Junghandel-Gurlitt, *Baukunst Spaniens*.

BERTH. Originally, the lodging provided for any one on shipboard, including the total space allowed. Later, a bunk of the kind put up in passengers' cabins, the word being apparently used as having a somewhat more elegant sound than the more exact term.

BERTY, ADOLPHE; historian and archæologist; b. Jan. 11, 1812; d. Sept., 1867.

Berty was associated with Alexandre Albert Lenoir (see Lenoir, A. A.) in his work on the *Statistique Monumentale de Paris*. He was chief collaborator of the *Histoire Générale de Paris*, undertaken with the approval of the Emperor Napoleon III., by Baron Haussmann (see Haussmann). Berty's share of this work was the *Topographie Historique du Vieux Paris*, of which he lived to publish only one volume on the *Région du Louvre et des Tuileries* (Paris, 1866). The publication of the *Topographie* was continued by H. Legrand and L. M. Tisserand, and completed in five volumes in 1887. Berty published also *La Renaissance Monumentale en France* (1864), *Les Grands Architectes Français de la Renaissance* (1860), and the *Dictionnaire de l'Architecture du Moyen Age* (1845).

Notice nécrologique in *Revue Générale d'Architecture*, Vol. XXV., 1867; Lance, *Dictionnaire*.

BERWART, BLASIUS; architect.

He was employed on the court of the old palace at Stuttgart (Würtemberg, Germany), which was begun in 1553. Sept. 26, 1563, he was sent by the Duke Christoph of Würtemberg to Georg Friedrich, Markgraf of Oberfranken, to build the palace at Plassenburg.

Lubke, *Geschichte der Renaissance in Deutschland*.

BESSEMER PROCESS; — STEEL. (See under Steel.)

BÉTON. In French, concrete; especially a concrete made with hydraulic lime, for setting rapidly under water. The term has been used in English to denote this sort of concrete as distinguished from other kinds, but its use is not very common.

BETTI. (See Juste.)

BEVEL (n.). *A.* The inclination of one face to another; the divergence of one part or face from the plane of another, or from a perpendicular to that plane. Thus, if a strut is to be inclined to the plate on which it is to stand, its lower end must be bevelled in order to have an even, uniform bearing; door saddles have, usually, their edges bevelled; parts of masonry may be bevelled so as to form a splay about a window opening.

B. A face making a bevel in sense *A.* (Compare Chamfer; Mitre; Splay.)

C. An instrument consisting of two flat straight-edged legs (one or both being usually slotted), and a clamping screw by which they are set at any desired angle. Used chiefly to lay off or measure a bevel, as defined above.

BEYAERT, HENRI; architect; b. 1823 (at Courtrai, Belgium); d. Jan. 23, 1894.

A Belgian architect of importance. Among his most notable works are the Banque Nationale in Brussels, the Banque Nationale in Antwerp, the Caisse d'Épargne at Brussels, the hospital at Tournay.

Nécrologie in *Emulation*, 1894, p. 28.

BEZANT. An ornament occurring in French Romanesque and Anglo-Norman architecture, consisting of a flat disk repeated in close succession, usually upon the flat face of an archivolt. The bezant was a mediæval Byzantine coin; hence, in heraldry, a circular disk, or spot, of gold, and in architecture, the coinlike ornament above described. Written also besant.

BIANCO, BARTOLOMMEO; architect; d. 1656.

An architect of Como in Lombardy who established himself in Genoa, Italy, where he erected three palaces for the Balbi family. One of the best of these, built for Paolo Balbi in 1623, became the Palazzo dell' Università in 1812.

Milizia, *Memorie*; Reinhardt, *Genua*.

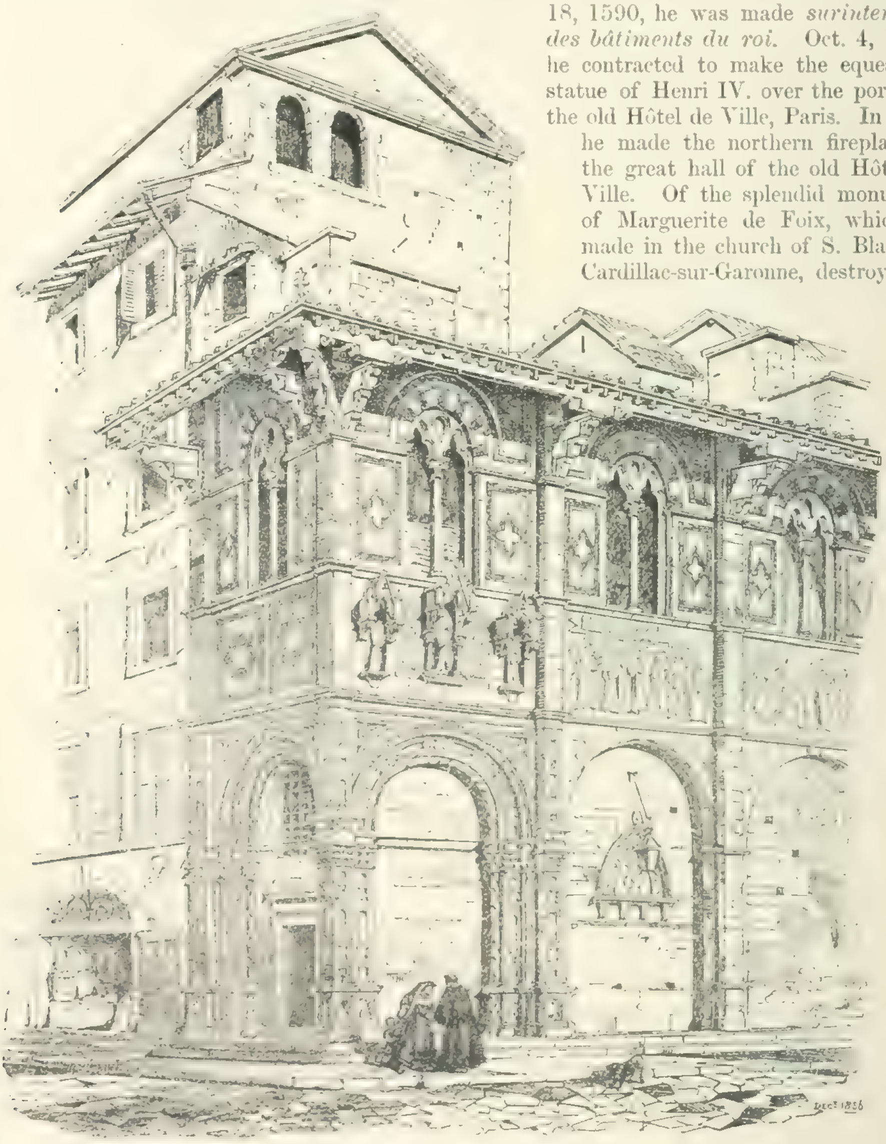
BIANCO SECCO. Fine white plastering, or pigment; an Italian term used in connection with mural painting.

BIARD (BIART), NICOLAS (COLIN), the Collin Byart of the *Comptes*; architect and builder (*maître-maçon*); b. 1460 (at Amboise, Indre et Loire, France).

Biard is said to have directed the construction of the château of Amboise, France, after March 3, 1499. In association with Jean de Doyac, Didier de Felin, and André de Saint Martin, he worked on the Pont Notre Dame, Paris, begun March 28, 1499. Soon after this he was charged by Louis XII. with the erection of that part of the château of Blois which was built during his reign. While occupied with this building he was invited, in 1504, by the Cardinal Georges d'Amboise, the minister of

Louis XII., to inspect the works at the château of Gaillon near Rouen. He visited Gaillon in 1505 and 1506, and seems to have been a general inspector, or supervisor, of the constructions there (see Fain, Pierre; Delorme, Pierre; and Senault, Guillaume). Dec. 14, 1506, he was called to Rouen to advise concerning the completion of the Tour de Beurre at the cathedral. Dec. 4, 1507, he was consulted concerning the dangerous condition of the tower of the cathedral of Bourges which fell Dec. 31. He began the reconstruction of this tower Oct. 19, 1508.

Deville, *Comptes de Gaillon*; Palustre, *Renaissance en France*; Leroux de Lincy, *Port Notre Dame*.



The Bigallo, or Loggia del Bigallo, Florence.

BIARD, PIERRE (I.); architect, painter, and sculptor; b. 1559 (Paris); d. Sept. 17, 1609.

He was probably the son of Noël Biard, a woodworker, employed at the Louvre under Pierre Lescot (see Lescot, Pierre). He studied in Italy, and on his return was commissioned to make the beautiful choir screen (jubé) of the church of S. Étienne du Mont, Paris. Sept. 18, 1590, he was made *surintendant des bâtiments du roi.* Oct. 4, 1605, he contracted to make the equestrian statue of Henri IV. over the portal of the old Hôtel de Ville, Paris. In 1608 he made the northern fireplace of the great hall of the old Hôtel de Ville. Of the splendid monument of Marguerite de Foix, which he made in the church of S. Blaise at Cardillac-sur-Garonne, destroyed in November, 1792, only the statue of Fame (*Renommée*) in the Louvre remains.

Berty, *Topographie, Louvre et Tuileries*; Palustre, *La Renaissance en France*; Gonse, *Sculpture Française*; Bauchal, *Dictionnaire*.

BIARD, PIERRE (II.); sculptor and architect; b. 1592; d. 1661.

A son of Pierre Biard (I.) (see Biard, P. (I.)). He was the preferred sculptor of Louis XIII., and was employed by the queen dowager, Marie de' Medici. He made two figures of rivers for the fountain in the Gardens of the Luxembourg, Paris. Biard made the figure of Louis XIII. for the bronze equestrian statue which stood in the Place Royal, Paris, until 1792. The horse was modelled by Danielo da Volterra (see Ricciarelli).

Gonse, *Sculpture Française*; Bauchal, *Dictionnaire*; Montaiglon, *Sur l'ancienne statue équestre.*

BIBBIENA (BIBIENA). (See Galli da Bibiena.)

BIBLIOTHÈQUE DE S. GENEVIÈVE. In Paris; a public library south of the Seine, occupying an interesting building designed by Henri Labrouste about 1850.

BIBLIOTHÈQUE NATIONALE. The national library of France, and the richest and most extensive in the world, occupying a series of buildings in the heart of Paris, north of the Palais Royal and the Louvre. The buildings are of many epochs, and there is much that is of architectural value, not only in the exterior, but also in the very beautiful fittings of some of the older rooms. The great reading room is an interesting modern structure vaulted in iron and ceramic tiles.

BIER STUBE. In German inns and eating houses, the room where beer and other drinks, and some few simple eatables, are served; called sometimes *Kneipe.* (See Beer Cellar; Rathskeller.)

BIGALLO. (Properly, Hospital of, or Loggia of, the Bigallo; a name having no historical meaning, but referring to a white cock, *bianco gallo,* the badge of a fraternity.) In Florence, a very beautiful fragment of a fifteenth century structure fronting on the piazza where stands the cathedral and baptistery.

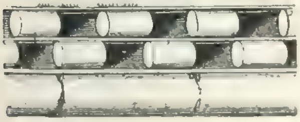
BILHAMER, JOOST JANSZON; architect, sculptor, and engineer.

Bilhamer was one of the most important artists of the latter half of the sixteenth century in Amsterdam. He built the western tower of the Oudenkerke in that city.

Galland, *Geschichte der Holländischen Baukunst.*

BILLART, CHARLES. (See Baillard, Charles.)

BILLET. Properly, one of a series of short, cylindrical, projecting members in, or forming, a moulding, its axis being parallel with the general surface and with the direction of the series. Hence, by extension, any similar projecting member of whatever section. (See Billet Moulding, under Moulding.)



Billet Moulding at Binham Priory, Norfolkshire.

BILLIARD ROOM. Any room intended primarily for playing the game of billiards, and designed of the proper size to accommodate one or more billiard tables with sufficient surrounding space for the players, and generally for observers as well. Previous to 1865, in America, as in Great Britain, the standard table was 6 by 12 feet, and the billiard room to accommodate one table was made 18 by 24 feet, wherever possible; the tables are now smaller and the cues shorter.

BILLINGS, ROBERT WILLIAM; architect, author, and descriptive draughtsman; b. 1813; d. 1874.

He was a pupil of John Britton (see Britton). His chief published works are a *History and Description of S. Paul's Cathedral, Churches of London, Illustration of the Temple Church in London, Carlisle Cathedral,* and *Durham Cathedral,* quarto volumes, published in 1840–1843, and especially the *Baronial and Ecclesiastical Antiquities of Scotland,* in four volumes. The accuracy of his drawings has never been seriously impugned, and their intelligibility and beauty are remarkable. They are far more valuable to the student than those of his master, Britton.

BILL OF QUANTITIES.

A tabulated statement of the quantities of material and the labour thereon required for the construction of a proposed building. It is derived from the drawings and specifications which have been prepared by the architect by a process of minute and detailed measurement on the scale of the drawings, aided by the figures thereon, anticipating, as far as possible, the various operations needed, and collecting them into their various trades, and finally, into a general summary, with blank spaces left for the insertion by the builder of his prices and the resulting totals. The purpose of a bill of quantities is to afford to a builder in customary form all the purely mechanical and clerical preliminaries for deducing from the drawings the value of the structure, to which may be added the further advantage (in usual regular practice) of this work being done only once, for all the builders about to estimate in competition.

The person who performs these duties is known as a quantity surveyor. He is usually trained for this branch of surveying and the closely allied one of "measuring up" work executed, to the exclusion of all others. He is appointed by the architect, and paid, either by the client, or by the successful bidder who has, of course, added the necessary amount in the blank space left for that purpose in the summary of the estimates.

The above outline is descriptive of British practice, which is settled and considered indispensable. American contractors usually prepare, each for himself, or by his clerks, the necessary bills and tables according to his own preferred system and method (or sometimes lack of both system and method), the whole number thus doing the work many times over. At first glance it appears strange that such a waste of labour should prevail; yet there are reasons for it which have influenced the leading builders themselves to discourage any change of their customs. The chief one is that they consider that their experience gives them an advantage in preparing estimates which would disappear if a large part of the work were done for them. In this case, they say, the builder of small attainments would dare, and would be enabled, to tender proposals for works which, under the present system, he is unable to approach. And consequently, this lower class of contractors would enter the field of high-class work, and, by greater competition, destroy its profits and degrade its quality. Let this argument be correct, or otherwise, it is the chief factor in the situation.

A few attempts have been made to introduce the English system into American practice, and failure has been, in part, due to lack of adaptation to local requirements. The bills prepared by surveyors have not placed before the bidder the items he is accustomed to value and price. This is what the use of the bill of quantities does in England, but by the builder in America the items are differently separated, the work is differently analyzed, and the builder's knowledge is not served by a table following the forms of English practice instead of the spirit. It is interesting to describe comparatively the details of the two systems. The English is minute and analytic to the verge of triviality. It seems to aim at complete presentation of the work without the aid of the drawings, or with only a preliminary observation of them; perhaps this was natural when the reproduction of drawings was tedious and expensive. The American builder's treatment is broad and sweeping; the items include the details in the descriptive titles, and rely upon the use of the accompanying drawings to explain them, as is natural when the plans can be so cheaply reproduced that every bidder can have a copy. For example, a street façade of freestone would, in the first case, be itemized as follows: cubic feet of stone; superficial feet of beds and joints; superficial feet of back joints; superficial feet of plain face; superficial feet sunk face in panels; of rusticated face; vermiculated face, etc.; labour, hoisting and setting *n* feet from ground; lineal feet, labour in cornice moulding, inches girth; labour only cutting details *n* inches by *n* inches; lineal feet labour on architrave mouldings *n* inches by *n* inches girth; labour only carving members as per sketch,—and so on for several pages, most of the items being repeated in numerous variations for similar features, and in a separate series for all curved and other "extra" priced works. In the American builder's estimate this work would be taken off in a few broad items, thus: (*a*) superficial feet of ashlar *n* inches thick, including setting; (*b*) cubic feet of stone cut in "trim," including cornices, bands, architraves, quoins, and all features not plain ashlar; (*c*) carving, a single sum based usually upon a foot superficial measurement; (*d*) any special feature, such as polished columns.

In other trades, notably in "carpenter and joiner," the detail is even more intricate, and the contrast more marked, as, for example, when one system analyzes all the processes of making a door in twenty items with five more for hardware, while the other simply describes the superficial feet of door, and the hardware, and prices them in two items only. Many of the tedious details in old style bills of quantities are, in fact, ignored by users, and their value included in the price of the items to which they pertain.

It will be seen that different kinds of ability in estimating are called for, and that bills of quantities to be acceptable to American builders must be framed in the spirit of their established custom.

It is only in accord with other experience with labour-saving devices to suppose that the reduction of the present repetition of clerical operations to a single process will become customary as soon as it is made acceptable in form.

(See Builder; Contract; Cost of Building; Estimating; Proposal; Tender.)

— ROBERT W. GIBSON.

BILTMORE HOUSE. An American country house and estate near Asheville, North Carolina. The house was built from the designs of Richard Morris Hunt about 1891.

BIN. A box or boxlike compartment, with or without a cover, for the storage of coal, grain, and the like. Hence any subdivision or alcove wholly, or partly, enclosed for such a purpose.

BINDER. Material, or a member, used to bind; specifically:—

A. A binding beam or binding joist; a girder to support floor joists.

B. Loose material used to bind together other pieces or materials; thus, sand or earth may be used as a binder for the crushed stone in road building.

C. In masonry, a header; a bond stone.

BINDER, BASTIAN; architect.

Bastian Binder finished the western front of the cathedral of Magdeburg, Germany, early in the sixteenth century.

Dohme, *Geschichte der Deutschen Baukunst.*

BINDESBOLL, MICHAEL GOTTLIEB; architect; b. Sept. 5, 1800; d. July 14, 1856.

A Danish architect. In 1822–1823 Bindesböll studied in Germany and France. Having won the travelling stipend at the Academy of Copenhagen, he went in 1835 to Italy and Greece. In August, 1835, he presented his design for the projected Thorwaldsen Museum at Copenhagen, which was finished in 1847. In March, 1856, he was made professor at the Academy in Copenhagen.

Weilbach, *Nyt Dansk Kunstner-lexikon.*

BINDING PIECE. Any piece, especially in framing, for use as a binder; specifically, a piece framed between two beams or the like to prevent lateral deflection (C. D.). (Compare, for other methods, Bridging.)

BIRDE, WILLIAM; ecclesiastic and architect; d. 1525.

Birde continued the construction of the abbey church of Bath, Somerset, England, and built a monumental chapel in the choir.

Britton, *History of Bath Abbey Church.*

BIRD'S MOUTH. An angular notch cut in the end of a timber to fit the arris or corner of a transverse timber upon which it is to abut; as the notch at the foot of a rafter engaging the roof plate.

BIRS NIMROUD. A great mound on a marshy plain near the Euphrates; the modern Arabic name signifying "Palace of Nimrod." It was in this mound that many of the earliest discoveries of Chaldean monuments were made by Austen Henry Layard, about 1848, the mound consisting mainly of the unburnt bricks of which the platform and palaces had been composed. (See Mesopotamia.)

BISCHOFF, PETER (VON ANGELSHEIM); architect.

April 25, 1473, Peter attended the reunion of architects and builders at Regensburg, Bavaria, Germany, of which Jost Dotzinger (see Dotzinger, J.) was the leading spirit. He appears as architect of the cathedral and city of Strasburg (*Werckmeister des Mauerhoffes*) in a document (*Hüttenbrief*) dated May 1, 1473, which bears his name and seal. His work included the supervision of the streets, pavements, bridges, and all public works of the city.

Gérard, *Les Artistes de l'Alsace*; Schneegans, *Les Architectes de Strasbourg.*

BISHOP'S CHAIR. Same as Bishop's Throne.

BISHOP'S PALACE. (See Episcopal Palace.)

BISHOP'S THRONE. The chair of state in a cathedral church intended for the bishop when presiding at a solemn function. In early times the bishop's throne was erected in the apse, and commonly on the middle or central axis of the church, with seats for the inferior clergy on either side. In later times this was shifted to the choir, and the throne forms a part of the elaborate arrangement of Choir Stalls. In such a case it is commonly the easternmost stall on the south side, or the one nearest the central door on the south side and within the jubé; the place not being absolutely fixed, but the throne having always a marked difference from the other stalls and being alone, that is, having no other stall in front of it. Some ancient episcopal thrones remain in the treasuries of churches or in the churches themselves, but admittedly not in the ancient place; these are looked upon as relics of the past, with a certain sanctity about them, rather than as chairs intended to be used in the church service. — R. S.

Bishop's Chair in Cathedral at Aquileja

BLACHERNAL PALACE (or Palace of Blachernæ). An ancient residence of the emperors at Constantinople, on the extreme northern point of the city, on the harbour. Only a few traces of it are known, so far as European research has yet gone.

BLACK AND WHITE WORK (I.). Building with a frame of timber and with filling between the frames of rough masonry of any kind or even with double plastering on oak laths. The common appearance of houses built in this way throughout England during five or six centuries was nearly always that of black or gray bands alternating with white spaces, the total amount of walling being nearly equally divided between the two tints.

BLACK AND WHITE WORK (II.). Same as Sgrafitto. A name given, perhaps, by those who first wrote of it in English.

BLACKBURN, WILLIAM; architect and surveyor; b. Dec. 20, 1750; d. Dec. 28, 1790.

He studied first with a surveyor and afterward entered the Royal Academy, London. He was intimately associated with John Howard, and assisted him much in his prison reform. Howard considered him the only architect capable of realizing his conception of an ideal prison. In 1782 he won a 100 [illegible] prize for the best design for a penitentiary. He built the county jail at Oxford, improved the jail at Newgate in Dublin, Ireland, designed the jail at Limerick, and was engaged in numerous similar undertakings when he died. Blackburn had also a considerable general practice as an architect.

Redgrave, *Dictionary of Artists*; Leslie Stephen, *Dictionary of National Biography*.

BLANK (adj.). Bare; without important features, especially without openings. Said of the wall of a building having no doors or windows; or of a more or less deceptive representation of a door, window, or the like, having no opening. Usually in combination, as blank wall; blank window.

BLAZONRY. In heraldry, originally and properly, the explanation of a coat of arms, or of any arrangement of heraldic bearings; by extension, the bearings themselves, and especially the display of colours, gilding, mantling, plumes, and the like, by means of which heraldic bearings are made decorative.

BLEACHING BOARD. One of the seats provided for spectators at a race course, a ground for athletic exercises, or the like, but not covered by a roof as are the seats of a grand stand; any rough or temporary seats put up for such a purpose. Usually in the plural. (Popular, United States.)

BLIND (n.). A device for partially or wholly preventing light passing through an opening; specifically: —

A. In the United States, a movable screen, generally of wood, so attached to the door or window as to be readily opened or closed, as by hinges at the sides or top, or by sliding. The term is usually confined to such screens when composed of fixed or movable slats which obstruct the light, while allowing ample openings for the admission of air; the word Shutter being applied to such as are solid or nearly so, as when consisting of sheet iron, or panelled wood; but no absolute distinction can be made. (Compare Louver Shutter, under Shutter.)

B. In Great Britain, a piece of flexible material, fitting the window opening and attached at the top or bottom to a roller by which it is wound or unwound; in the United States, called a shade.

Rolling Blind. *A*. Any blind of partially flexible structure, as of small strips of bamboo or the like, arranged to roll up, usually at the top of a window.

B. Sometimes, by extension from rolling slat or slats, one in which the slats are not fixed but free to rotate each on its own axis, the whole set being held together by a strip secured to each by a loop of wire.

Venetian Blind. A blind of which the slats are made to open and close; especially, a hanging blind, of which the slats are held together by strips of webbing and controlled by cords so that they may be opened or closed at will, and so that they may be drawn together and packed closely above the window.

BLIND (adj.). *A*. Having no windows; said of a building or part of a building which usually has them. Thus, a blind clerestory or a blind nave is one where the aisles rise so high on either side as to prevent the opening of windows above the aisle roofs.

B. Same as Blank, as in the compound terms Blind Arch; Blind Window. (See also the term Blind Alley, in which the significance of the adjective is stretched beyond its more usual meaning.)

BLIND ADJUSTER. *A*. In the United States, an apparatus for holding window shutters in place at a required angle; especially for holding them bowed or nearly shut.

B. A contrivance for holding the slats of a Venetian or louvered shutter at any given angle; usually by means of a spring which presses upon the end of one slat of a connected series.

BLIND ALLEY. A narrow passage whose end is closed; a *cul de sac*.

BLIND AREA. (See under Area.)

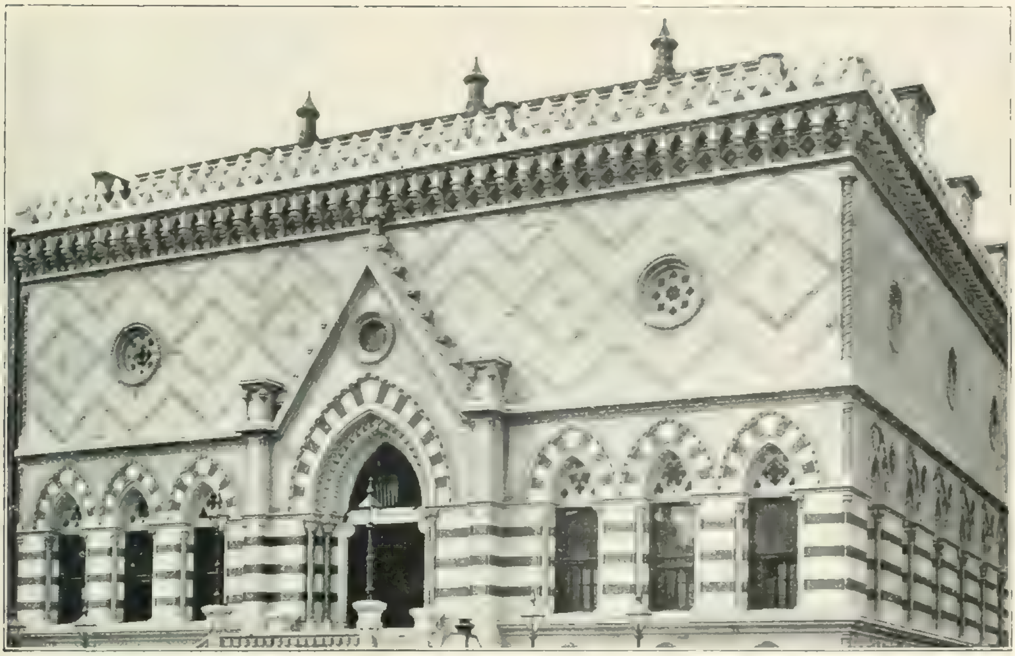
BLIND FAST. A catch for securing a blind or shutter either when closed or wide open, or both. They are of two kinds, those actuated by a spring, which automatically catch upon a pin, hook, or other projection; and those which are set by hand — usually in the form of a long bar or hook to be engaged in a socket or screw-eye. They are usually made of galvanized iron.

BLIND LIFT. A handle or knob upon a vertically sliding blind or inside shutter, by which it is lifted to open it, as in a railway car, or to close it, as commonly in a street car.

BLIND PULL. A device for drawing toward one a blind, in the sense of a hinged shutter, and either closing it, or holding it closed while it is being secured, or for opening it.

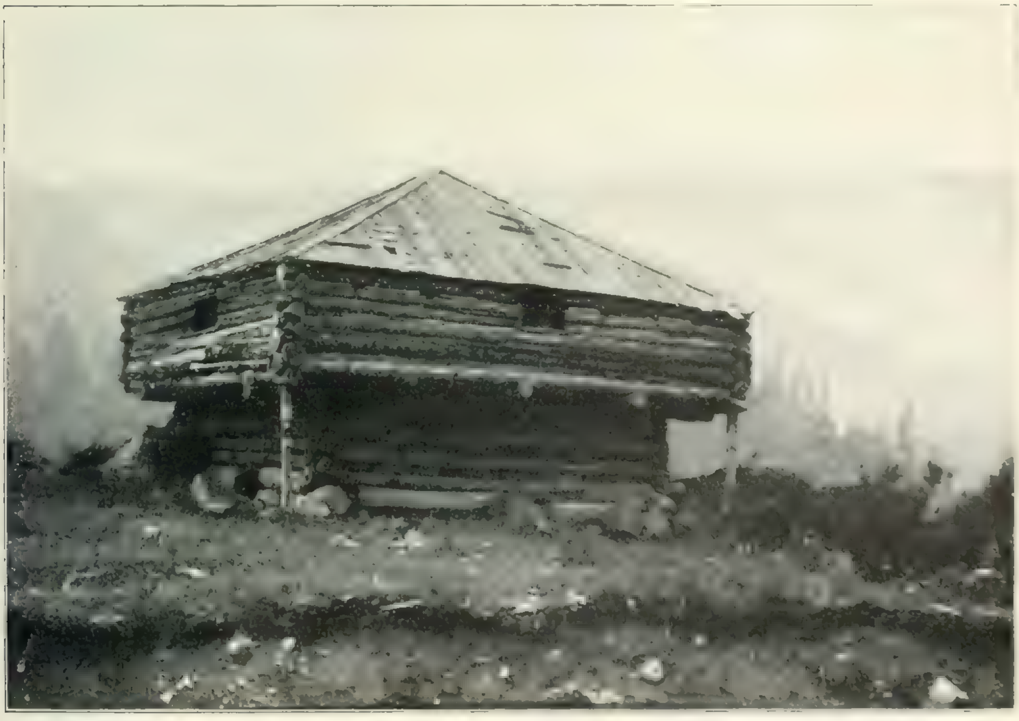
BLIND STORY. A story, or important exterior horizontal division, having no windows nor other openings of consequence; especially, in mediæval church architecture, a triforium assumed to be without exterior windows; as opposed to clerestory, which lighted the interior by means of windows above the roof of the triforium.

BLISTER. A defect in the form of a slight projection of a surface detached from the body of the material, caused in manufacturing or by weather or other agencies, as the protuberance sometimes formed on the face of a casting, due to the presence of an air bubble just below the surface; or the loose, slightly raised portions of a coat of paint which have become detached from the material to which the paint has been applied, due to defective workmanship or other causes.



BLIND STORY

The second and third story of the National Academy of Design, in New York; built about 1865 from the designs of P. B. Wight. The third story is occupied by top-lighted galleries, and the circular openings are for ventilation only.



BLOCK HOUSE

"The Middle Block House" at Cascades, on the upper waters of the Columbia River, State of Washington.

BLOCAGE. Masonry composed of small irregularly shaped stones laid in a mass of mortar. The great body of walls and vaults in Roman imperial buildings were composed of blocage, with a facing of thin bricks or of dressed stone, large or small. The term is French, and is adopted into English because of the lack of a term carrying exactly the same signification. It differs from Concrete and Béton in that the stones and mortar are not mixed together and thrown into the place which they are to occupy, but are built up much as bricks are laid, but with less regularity. — R. S.

BLOCK. *A.* A piece of stone or terra cotta prepared, or partly prepared, for building.

B. A mass projecting from a larger piece of stone, as in some unfinished masonry of the Greeks. (See Boss (I.).

C. In carpentry or joiner's work any small, more or less symmetrical, piece of wood, used for whatever purpose, as behind a wainscot, or other work which is to stand out from a wall; under any horizontal member to give it a proper level; in the angle between the sides of a box; the top and front rail of a chest of drawers or cabinet, or the like; a traditional means of giving stiffness or support where there is no room for braced framing.

D. A row or mass of buildings closely connected together, or a single structure which — perhaps divided by party walls — contains a number of stores or shops with dwellings above them, or dwellings only, or small apartment houses. (In this sense, peculiarly American.)

E. In a city or the like, where streets are near together, the whole space within and enclosed by three or four streets so as to present a front of houses upon each of those streets. Hence, by extension, the length of such a block upon any one street; thus, we say that in the upper part of New York City twenty blocks, taken with the streets between them, make up a mile. (In this sense, English as well as American; see Masson's *Memoir of Milton*, Chapter 1647–1649, and the quotations in *New English Dictionary*.) The city block is capable of refined treatment, first in a strictly architectural sense, as when the exterior fronts are treated either according to a common design, elaborated in advance, or when succeeding builders of separate narrow fronts are careful to conform one to the other, not necessarily by strict imitation of style, height, or the like, but by intelligent adaptation of the newer to the older fronts. This is very rare, except when, as in Paris, under the authority of the municipality, the heights are kept severely limited, and the regulations as to windows and the like are enforced; or when, as in Nuremberg, an authoritative commission regulates the style to be observed in all designs. On the other hand, the interior of a block is capable of a great deal

of skilful treatment, rather in the way of landscape architecture than of architecture in the usual sense. Thus, in certain blocks of London, and a few in the United States, the whole space enclosed by the rear walls of the houses is opened into a kind of garden with trees planted with some reference to general effect, and the divisions between the back yards are to a certain extent effaced, at least to all appearance. The custom, very general in England, of sending out washing to laundries in the country aids this plan, whereas the more common American custom, of doing the washing in the house, however good in a hygienic sense, has for a result the destruction of the back yards considered as open places of some attractiveness. Lots are often sold with strict limits as to the front line of the house, so as to leave a small courtyard or open area for the whole length of the block; but the same regulation must be extended to the interior if it is desired to prevent libraries, dining rooms, and the like, from being built to the very extreme end of each separate lot, thereby destroying the interior garden. — R. S.

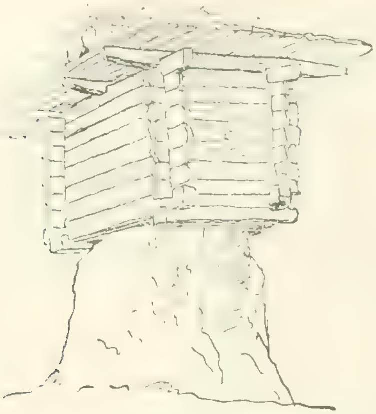
Hollow Block. A terra cotta slab or large brick made with an opening or several openings in its body; usually for purposes of ventilation, or for lightness or economy where great strength is not needed: in those used for ventilation there are two general sorts — those which when put together form a continuous tube for the passage of a current of air, and those which are intended merely to provide an air space to prevent the passage of moisture from the outside to the inside of a wall, or as a means of insulation in fireproofing. The term "block" is commonly used instead of brick to describe such building material made of baked clay, and considerably larger than the usual bricks.

BLOCK (v.) To set or provide with a block or blocks in sense of Block, *C*; to secure or place in position by means of such blocks; to perform the operation of blocking. Commonly used with the adverb, as block up, block out.

BLOCK AND CROSS BOND. (See under Bond.)

BLOCK BOND. (See under Bond.)

BLOCK HOUSE. In military architecture, a structure of informal character, frequently of wood, built to protect a small party who may have to defend a pass, a ford, or the like. The mere extension of the temporary intrenchment which would be thrown up at such a point. In the United States, a log structure with many loopholes, used in various parts of the country for defence against Indians as a kind of fort. It was built like a log cabin, but with an upper story projecting several feet beyond the lower one on every side, for the purpose of bringing the exterior at the ground within range of the defenders' weapons through loopholes in the [illegible] preventing the enemy from forcing the [illegible] applying the torch. (Compare Machicolation.) A form of block house employed in some Spanish American settlements, as [illegible], has been constructed with double walls



Block House near Kuerdschekoï, Asia Minor.

Described by Petersen and v. Luschan as very carefully built of squared timbers and planks, showing, at the corners, the interlocking construction characteristic of Lycia. The building is raised on a mound of earth.

of planking, the space between the planks being filled with rough stone. Such walls approached two feet in thickness, and were almost impregnable to rifle fire.

BLOCKING. Blocks considered collectively in the sense of Block, *C*; the operation of furnishing with, or setting, such blocks.

BLOEMAART, CORNELIS; architect, painter, and engineer; b. about 1525.

Architect and engineer in Holland in the sixteenth century. According to Van Mander (op. cit.) he was born at Dortrecht, Holland. He migrated later to Gorinchem, where his more famous son, the painter Abraham Bloemaart, was born. He afterward appears at Hertogenbosch (1566), and in 1576 was entered in the guild of saddlers at Utrecht as architect and military engineer. In 1591 he became engineer to the city of Amsterdam.

Galland, *Cornelis Bloemaart* in *Kunstchronik* 1888, p. 654; Van Mander, *Het Leven der doorluchtighe Nederlandtsche en eenighe Hooghduytsche Schilders.*

BLOET, ROBERT; bishop; d. 1123.

Robert Bloet, Bishop of Lincoln, England, finished the construction of the first (Norman) cathedral of Lincoln, which had been begun by Bishop Remigius (d. 1094). (See Remigius.)

King, *Handbook of the Cathedrals of England.*

BLONDEL, FRANÇOIS; architect; b. 1617 or 1618 (at Ribemont, Picardie, France); d. Jan. 21, 1686.

In 1652 Blondel was appointed tutor of the son of Henri Auguste de Loménie, Secretary of State to Louis XIV., and travelled with him in Germany and Italy. He was afterward employed in several negotiations with foreign governments, notably at Constantinople. On his return he received a brevet as counsellor of state. He was also made tutor of the Dauphin and professor of mathematics at the *Collège Royale.* His knowledge of architecture was acquired during his travels. Blondel's first practical work was the reconstruction of the bridge at Saintes (Charente Inférieure, France). In 1670 he built the triumphal arch of the Porte S. Bernard, Paris, which was destroyed in the Revolution. In 1673 he rebuilt the arch of the Porte S. Antoine, Paris. Blondel's greatest monument is the triumphal arch in Paris called the Porte S. Denis, which was begun in 1674. The sculpture was begun by Girardon (see Girardon), and finished by Michel Anguier (see Anguier). In 1672 he was made director of the *Académie de l'Architecture*, established in 1671. On account of his knowledge of fortifications he was made *maréchal-de-camp* in 1675. His published works are *Cours d'Architecture enseigné dans l'Académie Royale* (Paris, 2 vols., 4to, 1675–1683), *Cours de Mathématique pour le Dauphin* (1683), *L'art de jeter les bombes et nouvelle manière de fortifier les places; Une Histoire du Calendrier roman* (1682).

Quatremère de Quincy, *Histoire de la vie des plus célèbres architectes;* Guiffrey, *Comptes des bâtiments sous Louis XIV.;* Lance, *Dictionnaire;* Hoffbauer, *Paris à travers les Ages.*

BLONDEL, JACQUES FRANÇOIS; architect; b. Jan. 8, 1705; d. 1774.

He is supposed to have been the son of Jean François Blondel (see Blondel, J. F.). May 6, 1743, with the approval of the *Académie de l'Architecture*, he opened one of the earliest of the French private schools of architecture. The success of this school won for him the position of *architecte du roi* and, in 1756, a membership in the *Académie de l'Architecture.* In 1762 he was made professor at the Louvre. In 1773 he presented a plan for the improvement of the city of Metz. In 1768 he planned the Hôtel de Ville and *Salle de Spectacle* at Strasburg, Elsass, Germany. He planned the reconstruction of the abbey of S. Armand near Valenciennes, Nord, France, and the restoration of the cathedral of Châlons-sur-Marne. In 1765 he was a member of the commission charged with the conservation of the cathedral of Strasburg. Blondel was an accomplished engraver. He completed the *Architecture Française* begun by Jean Marot (see Marot, J.) and published, 1737–1738, *De la distribution des maisons de plaisance et de la décoration des édifices en général*, and after 1771 the *Cours d'Architecture*, Paris, 1771–1777, 6 vols., 8vo., which was continued after his death by Pierre Patte (see Patte).

Arch. Pub. Soc. Dictionary; Milizia, *Memorie;* Lance, *Dictionnaire.*

BLONDEL, JEAN FRANÇOIS; architect; b. 1683 (at Rouen, France); d. 1756.

He is not supposed to have belonged to the family of the great François Blondel (see Blondel, F.). He was *architecte du roi* and *trésorier-général des bâtiments du roi*, and in 1728 was admitted to the *Académie de l'Architecture.* A number of unimportant buildings are attributed to him (see Blondel, Jacques F.).

Jacques François Blondel, *Cours d'Architecture*, Vol. VI., p. 468; *Arch. Pub. Soc. Dictionary;* Lance, *Dictionnaire;* Bauchal, *Dictionnaire.*

BLONDEL, PAUL; architect; b. Jan. 6, 1847; d. April 18, 1897.

He entered the *École des Beaux Arts* in 1864. He won the *Premier Grand Prix de Rome* in 1876. After his return from Rome he was appointed *inspecteur des bâtiments civils* and architect of the *Cour de Cassation.* He succeeded Edmond Guillaume (see Guillaume) as architect of the Louvre and the Tuileries.

Ch. Lucas, in *Construction Moderne*, May 1, 1897.

BLOUET, GUILLAUME ABEL; architect; b. Oct. 6, 1795; d. May 17, 1853.

In 1814 Blouet entered the atelier of Jules Delespine. In 1821 he won the *Premier Grand Prix de Rome.* His fourth *envoi de Rome* was a restoration of the baths of Caracalla which was published by the French government in 1826. In 1827 he was appointed architect in charge of the baths of Julian (*les thermes*) in Paris. In 1828 Blouet was made director of the section of architecture and sculpture of the expedition to the Morea, the results of which he published in the *Expédition scientifique de la Morée, ordonnée par le gouvernement français* (3 vols., folio, Paris, 1831). In 1831 Blouet replaced Huyot (see Huyot) as architect of the Arc de l'Étoile, Paris. He built the attic completing the arch in 1836. (See Chalgrin.) In 1836 he was sent to the United States to study reforms in prison construction. In 1846 he replaced Louis Pierre Baltard (see Baltard, L. P.) as professor of the theory of architecture at the *École des Beaux Arts*, Paris. In 1847 he published a supplement to *l'Art de bâtir* of Rondelet. (See Rondelet.) In 1848 he was appointed architect in charge of the château of Fontainebleau.

Lance, *Dictionnaire;* Bellier de la Chavignerie, *Dictionnaire;* Bauchal, *Dictionnaire.*

BLUE PRINT; **BLUE PROCESS.** Same as Cyanotype, in both senses.

BLUE STONE. A term of no lithological significance, and usually applied to rocks of a

gray or blue-gray colour. In Maryland, a gray gneiss; in New York and Ohio, a blue-gray sandstone. (See next term.) — G. P. M.

BLUESTONE. Specifically, a compact and durable sandstone quarried in the foothills of the Catskill Mountains in New York State. The sidewalks of New York City are generally composed of flags of this material; and it is largely exported for the same purpose to other parts of the United States. A quality superior as to colour and uniformity of grain is used in decorative architecture, and is of singular value. The great basin of the Bethesda fountain in Central Park, and the elaborate pedestal and exedra of the Farragut monument in Madison Square, both in New York City, are entirely composed of this material. (See preceding term.) — R. S.

BOARD. A slab of wood cut to a more or less uniform shape, and thin as compared to its width and length. Specifically, such a piece of lumber not more than about $1\frac{1}{4}$ inches thick. (See Lumber.)

BOARD (v.). To cover or sheath with boards. In housebuilding in the United States, a frame structure is said to be boarded when the frame has been covered in with the sheathing boards, previous to the addition of clapboards or shingles.

BOARD AND BRACE WORK. A method of construction, for partitions and the like, consisting of boards with grooved edges into which thinner boards are inserted like panels, forming alternating projections and recesses.

BOARDING. *A.* Boards in general, or a quantity of boards taken together.

B. The act of covering a surface with boards, usually by nailing to a frame of wood.

C. The covering or thickness of boards applied, as in *B.* Thus, the boarding of the exterior of a frame house in the United States is commonly double, first the Sheathing and then the Siding.

BOARD MEASURE. The standard system for the measurement of lumber. A board foot is a square foot one inch thick, and hence the equivalent of 144 cubic inches. A 3″ × 4″ stud measures one board foot per foot of length; a 6″ × 12″ beam measures 6 board feet per foot of length. No allowance is made for loss by sawing, planing, or other dressing; $\frac{7}{8}$-inch planed boards are reckoned as 1 inch thick. Lumber is sold by the M or thousand board feet. The board foot, the "hundred," and the "M" or thousand are the only units in common use.

BOAST (v.). To shape stone roughly in preparation for subsequent finer dressing; more specifically, to dress with the Boaster or Drove. (See Stone Dressing.)

BOASTER. Same as Drove. A tool for stone dressing.

BOAT HOUSE. *A.* A structure built at the water's edge to receive boats when not in use. This may be a light structure covering a water slip, or small wet dock, and so enclosing and protecting the boat; or it may be larger and contain machinery for raising boats from the water and the storing of them above.

B. A house at the water's edge with a platform serving as a quay for embarkation and disembarkation.

BOB. Same as Plumb Bob; abbreviated form.

BOBLINGEN, MATHIAS VON. (See Mathias von Boblingen.)

BOCCADOR. (See Domenico da Cortona.)

BOCCANEGRA (BOCCANERA), MARINO (or **MARTINO**); engineer and architect.

Boccanegra, a member of the great Genoese family of that name, began about 1275 the arsenal at Genoa, Italy. In 1276–1278 he built the *mandracchio*, or harbour for small vessels, and in 1283 commenced the old mole, Genoa. He finished the aqueduct from Tresasco in 1295.

Arch. Pub. Soc. Dictionary.

BODEGA. In Spain and in Spanish-America, and hence in parts of the United States, generally, a wine vault or cellar; a wine shop where liquors are drawn from the cask; a storeroom, a warehouse.

BODT, JOHANN VON (JEAN DE BODT); architect; b. 1670 (in Paris); d. 1745 (in Dresden).

Von Bodt was the son of a Mecklenburger who went with William III. to England. He came under the influence of Daniel Marot (see Marot, D.), and in 1700 went to Berlin where he built the stairway and the main portal of the Zeughaus. He built also the portal of the Stadt Schloss at Potsdam near Berlin (1701), which shows the influence of Daniel Marot. He was also employed in the erection of fortifications. With Zacharias Longuelune (see Longuelune) he rebuilt the Hollandische, afterward called the Japanische, Palast in Dresden.

Schumann, *Barock und Rococo*; Dohme, *Barock und Rococo Architektur*; Ebe, *Die Schmuckformen der Monumentalbauten.*

BODY. *A.* The larger, or more central mass of a building having varied parts, as a church.

B. The shaft, or plain upright part, of a pillar or pier of any sort.

C. Solidity, mass, thickness, and the like, taken in the abstract; thus, it may be said that such a paint lacks body.

BODY COLOUR. A colour or paint having body, *i.e.*, rendered heavy and opaque; especially, in water colour work, a paint mixed with white.

BODY RANGE; BODY VAULT. In a groined or ribbed vault, the larger and higher vault which the smaller ones intersect.

BOESWILLWALD, ÉMILE; architect; b. March 2, 1815 (at Strasburg); d. March 20, 1896.

Boeswillwald was apprenticed to a mason and studied architecture in the atelier of Labrouste (see Labrouste). In 1845 he was appointed inspector of the works of restoration of the cathedral of Paris under Viollet-le-Duc (see Viollet-le-Duc) and Lassus (see Lassus). He assisted Duban (see Duban) and Lassus in the restoration of the Sainte Chapelle, Paris. In 1849 he was appointed diocesan architect of Luçon, Soissons, Bayonne, Orléans, and later of Chartres, and restored many of the cathedrals and churches of France. He organized the service of the *Monuments Historiques* in Algeria and Tunisia.

Construction Moderne, March 28, 1896.

BOFFRAND, GERMAIN; architect and decorator; b. May 7, 1667; d. March 18, 1754.

The son of Germain Boffrand, an architect and sculptor of Nantes, France. He went to Paris quite early and studied architecture, probably under Jules Hardouin-Mansart (see Hardouin-Mansart, Jules). In 1690 he was made custodian of the drawings in the *cabinet du roi.* In 1706 he assisted in the decoration of the Hôtel Soubise, Paris. In 1708 he was admitted to the Académie de l'Architecture. Between 1715 and 1718 Boffrand rebuilt a great part of the Arsenal, Paris, where he decorated a *salon.* Between 1725 and 1727 he repaired the southern portal of the church of Notre Dame, Paris, with the rose window. Nov. 29, 1711, he was made chief architect of the Duke of Lorraine at Nancy, where he built the great altar of the cathedral and the *Hôtel de la Monnaie.* He was architect of the Duke of Bavaria, for whom he erected a hunting lodge, and worked also on the episcopal palace at Würzburg, Germany. In France, Boffrand held the position of *architecte du roi* and *premier ingénieur et inspecteur général des ponts et chaussées du royaume.* In 1745 he published the *Livre d'Architecture contenant les principes généraux de cet art*, etc.

Jean François Blondel, *Cours d'Architecture*; Guilmard, *Les Maîtres ornemanistes*; Mariette, *Abécédario*; Bauchal, *Dictionnaire.*

BOGHEM, LOUIS VAN; architect.

Architect of Margaret of Austria, aunt of Charles V. [1500–1558] and gouvernante of the Netherlands. There exists a contract dated March 3, 1524, between Van Boghem and André Nounton, quarry master of Dinant, for the erection of the monument of Franciscus, Archduke of Austria, in the church of Coudenberg in Brussels, Belgium.

Messager des Sciences historiques, 1858, p. 105.

BOHEMIA, ARCHITECTURE OF. A casual glimpse at the history of Bohemia will lead one to expect to find little but ruins of its mediæval buildings, because, in addition to the misfortunes which assailed the eastern states of Germany, it was involved in those religious dissensions which commenced here nearly a century earlier than in other parts of Europe, and attained to a more acute form than anywhere else except, perhaps, Scotland. Thus, what Gothic churches still exist are for the most part mutilated fragments of ancient buildings patched up and modernized in later times.

The mediæval architecture of Bohemia was, however, extremely rich and, especially during the reign of Karl IV., great works were undertaken chiefly at Prague and Kuttenberg, and what remains of them gives us some faint idea of their former magnificence.

The views of Prague from the Moldau, or looking down upon the city from the Volks-Garten or "The Belvedere" present a vision of singular beauty. The great rocky platform of the Hradschin to the west with its immense palace capped by the graceful apse and lofty tower of the cathedral, together with the Romanesque spires of the Benedictine Abbey of S. George and the huge round tower of Dalliborka with its grim associations, rising sheer out of the valley, in the foreground. The great river with its noble old bridge and Gothic towers in the centre, and the countless spires, domes, and towers of the Altstadt to the east, the craggy rock of the Wisserhad to the south, cannot fail to raise in the mind expectations of a rich architectural treat. When, however, one comes to examine the city more in detail, disappointment is inevitable. The cathedral, though interesting and beautiful, is only the choir and tower of what would, if completed, have been a noble church, but at present is but a fragment, mutilated and injured. The noble spire which once crowned its tower (in its day the loftiest building in all Europe) was destroyed about the middle of the sixteenth century and replaced by the present not unpicturesque bulb-shaped structure. The internal fittings and stained glass were destroyed by the Hussites and the nave was never built.[1] The aisles and chapel of the choir were the works of Mathias of Arras (1344) and are purely French in character. The lofty clerestory with its rich profusion of tracery and flying buttresses was completed in 1385 by Peter Arler of Gmünd, and the noble tower some years later.

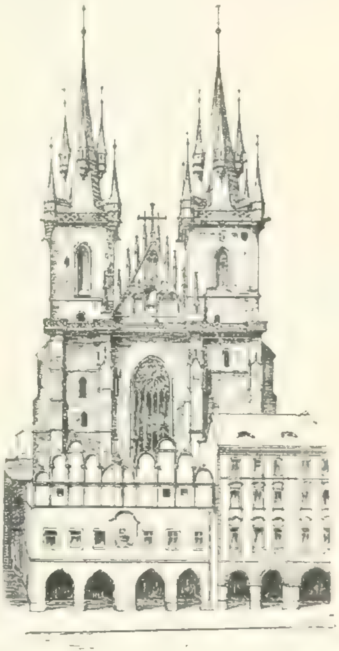
The Wenzel's Kapelle, 1347, forms a lower portion of an unfinished transept; its walls are adorned externally with mosaic evidently Italian, and internally with a series of small frescoes with borders of cut crystals. The work is said to be by a Russian artist, and if so it forms a curious link between Eastern and Western art.

There are many interesting monuments and some good old pictures, but no furniture or stained glass, such as one usually finds in German churches.

The abbey church of S. George, close to the cathedral, is a strange-looking Romanesque building considerably modernized, but containing interesting monuments of early Bohemian kings.

The noble old bridge over the Moldau has graceful Gothic towers at either end, adorned with niches and panelling. It was commenced by Peter Arler in 1357, who is also supposed to have built the town hall, with its stately tower and graceful chapel.

Few of the churches in Prague are worthy of notice. The Teyn church (1407–1460) is a large, lofty building with two picturesque western spires. The finest work about it is the great bronze bas-relief over the south door, representing the Resurrection. The vaulting internally is modernized, but there is an interesting baldachino over a side altar, somewhat similar to those at Ratisbon.


Bohemia. Teynkirche at Prague. 15th Century. The West Front.

The Karlshofer Kirche (1377) is a very interesting work, though much modernized externally; the nave consists of a great octagon unsupported by pillars, with an elaborate network vault. The choir is apsidal.

The old thirteenth century synagogue is an elegant building with a row of columns down the centre.

Many of the older houses in Prague are built over vaulted arcades, and often exhibit remains of graceful Gothic architecture.

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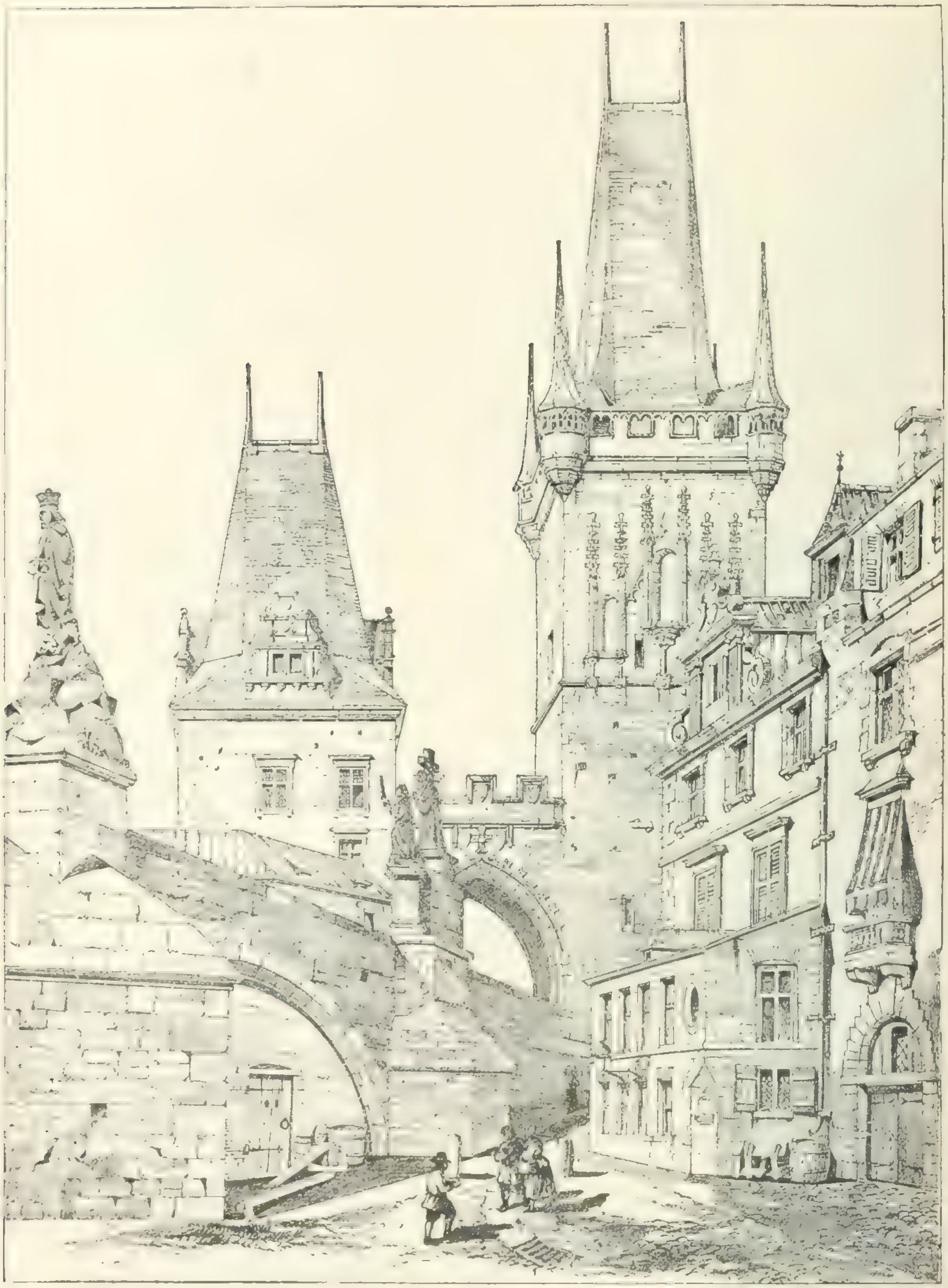
[1] It is now, however, being erected.

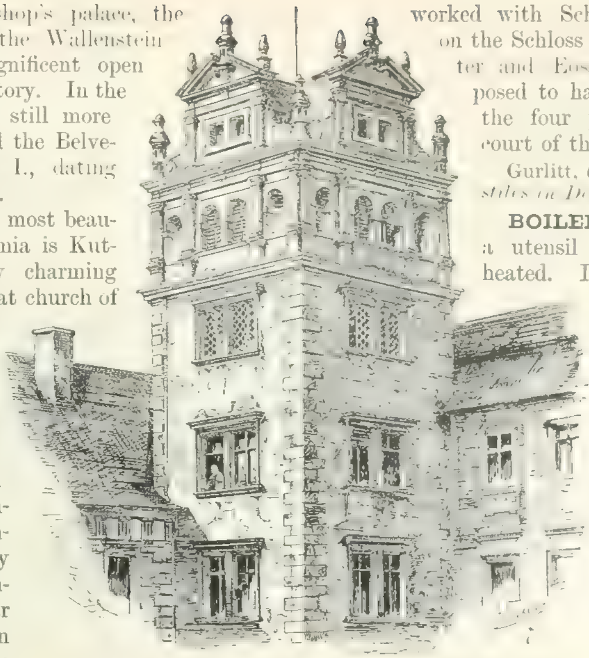


Bohemia: Karlsbrücke at Prague. West End with Towers.

The palaces are stately buildings. That of the Hradschin possesses a magnificent late Gothic hall said to be the largest stone vaulted hall in existence, unsupported by columns. It dates from the close of the fifteenth century. The Renaissance portion of the palace seems to have been commenced by Scamozzi (1607–1614). The gateway is certainly handsome. The palaces in the town itself are of neoclassic architecture and, like those of Vienna, are treated in a stately manner; the most striking are the Kinsky palace, the Clamgallas palace in the Karlsgasse (1707–

1712), the archbishop's palace, the Thun palace, and the Wallenstein palace with a magnificent open hall or garden refectory. In the king's garden is a still more beautiful hall called the Belvedere of Ferdinand I., dating from the year 1543.

After Prague the most beautiful town in Bohemia is Kuttenberg, in a very charming situation. The great church of S. Barbara, with its lofty apse and chevet, stands upon a great rock overlooking the river. Like most of the Bohemian churches, it is unfinished, and consists alone of a very stately choir commenced in the year 1380 and carried on until 1541. The apse follows the French plan, but the rest of the choir is a "Hallenbau" with galleries round it; if completed it would probably have been the most magnificent church in the Austrian dominions.



Bohemia: Tower at Prague in the Rossmarkt.

There are several other interesting churches in Kuttenberg, and a particularly beautiful "fountain house" something like the Schönbrunnen in Nuremberg. Very fine churches are also to be seen at Pilsen and Kollin.

There are several interesting castles in Bohemia; that of Karlstein is the finest, it was erected by Karl IV. from the designs of Mathias of Arras in 1348, and is well preserved. The chapels are adorned with the same combination of paintings and mosaic that we see in the cathedral of Prague. There are also curious castles at Eger, Falkenau, Krummau, and elsewhere. The chapel in the castle of Eger is built in two stories, with an opening in the centre uniting them. It is said to have been built by Frederic Barbarossa about 1180, but the upper chapel is a century later.

Mittelalterliche Kunstdenkmale des Oesterreichischen Kaiserstaates; Ernst und Oescher, *Baudenkmale des Mittelalters in Erzherzogthum Oesterreich*; Brewer, H. W., *Papers upon the Mediaeval Architecture of Central Germany, Bavaria, and Bohemia*, published in *The Builder*, London, 1866 to 1890; Schmitt, *Abbildungen der Baualterthümer in Bömen*; *Allgemeine Bauzeitung* (about 30 vols.; and see Bibliography, Germany, Architecture of).

— H. W. Brewer.

BÖHME, MARTIN HEINRICH; architect; d. 1725.

Bohme was a pupil of Andreas Schlüter, and worked with Schlüter and Eosander on the Schloss at Berlin. (See Schlüter and Eosander.) He is supposed to have designed or built the four portals of the first court of that building.

Gurlitt, *Geschichte des Barockstiles in Deutschland*.

BOILER. In a general sense, a utensil in which water is heated. In plumbing, a strong closed vessel or reservoir of copper or galvanized iron, generally set in the kitchen, intended to store water heated by the Water Back in the range, until same is drawn at the plumbing fixtures. Properly speaking, the water back is the boiler, and what is called boiler is merely a reservoir for hot water. (For boilers as used for household warming, see Ventilation; Warming.) — W. P. G.

BOILER ROOM. The space provided for the boilers used for heating and ventilation, or for the generation of electrical or other power. In architectural practice this is commonly combined with Engine Room.

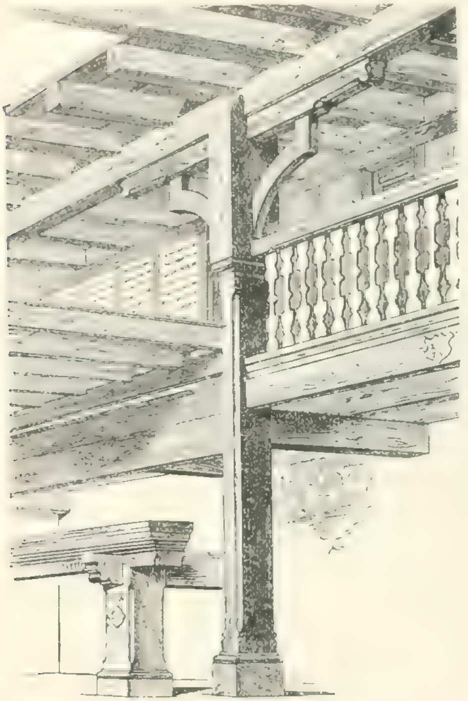
BOIS COMPRIMÉ; **BOIS DURCI**. Wood which, after lying long in the water, either by accident or design, is then pressed by hydraulic pressure into moulds of steel or other hard material. This has been used for decorative purposes.

BOLE. A fine soft clay, yellow or dark, coloured by iron oxide; formerly used as a pigment.

BOLLARD. A solid post on a quay or pier intended to receive the loops of hawsers or in other ways to serve for mooring vessels. The term is generally confined to stone posts or others of enduring materials. (Compare Pile.)

BOLOGNE (BOULOGNE), JEAN (GIOVANNI BOLOGNA, FIAMMINGO); sculptor and architect; b. 1524; d. Aug. 13, 1608.

Jean was the son of a sculptor [illegible] of Douai in French Flanders. Bologne is his family name, and has no connection with the city of Bologna in Italy. In 1540 he entered the atelier of the sculptor Jacques Dubroeucq (see Dubroeucq) at Antwerp. He spent several years in Rome, and about 1553 was invited to settle in Florence by Bernardo Vecchietti, at whose villa, *Il Riposo*, he lived for several years. The Grand Duke Francesco I de' Medici became his principal patron. April 28, 1563, Bologne was commissioned by Pius IV. (Pope 1559–1565) to make the famous fountain of Neptune at Bologna (finished 1567). His Flying Mercury, made in 1574, was first placed in the Acciajuoli gardens in Florence, and it was transferred to the Villa Medici, Rome, before 1598. When the Villa Medici was sold to the French government about 1769 the statue was brought back to Florence. About 1577–1581 Bologne made the colossal statue called L'Appenino (25 metres high) at the villa of Pratolino near Florence. He was also employed in the decoration of the Boboli gardens, Florence, his most important works there being the fountain of the *Isoletto* and the fountain of the *Grotticella*. There is a charming fountain by him at the villa of Petraia, near Florence. His equestrian statue of Cosimo I. was placed in the Piazza della Signoria, Florence, in 1594. His group of Hercules and the centaur in the Loggia dei Lanzi, Florence, was made between 1594 and 1599. In 1596 he began the three bronze doors of the facade of the cathedral of Pisa to replace those by Bonano da Pisa (see Bonano da Pisa) which had been destroyed by fire Oct. 24, 1595. He was assisted by Pierre Franqueville, his favourite bronze-caster, Fra Domenico Portigiani, and others. The fine statue of S. Luke at Or S. Michele, Florence, dates from 1602. In 1604 he began the equestrian statue of Henri IV., which, completed by Pietro Tacca, was placed in position at the Pont Neuf, Paris, Aug. 23, 1614 (destroyed Aug. 11, 1792). His figurines and smaller works are especially fine, among the best being the crucifix in the new sacristy of S. Lorenzo, Florence.



Bolster in Swiss Woodwork, 18th Century.

Desjardins, *La vie et l'œuvre de Jean Bologne*; Duthilleul, *Eloge de Jean Bologne*; Vasari, Milanesi ed., Vol. III.; Muntz, *Renaissance*; Baldinucci, *Notizie de' Professori del Disegno*.

BOLSTER. *A*. Same as Cushion.

B. A short piece of timber set horizontally across the top of a post, either to afford a greater bearing surface for a girder or girders, or to allow a post above to set between the ends of instead of upon the girders, or to shorten the span of a girder or girders.

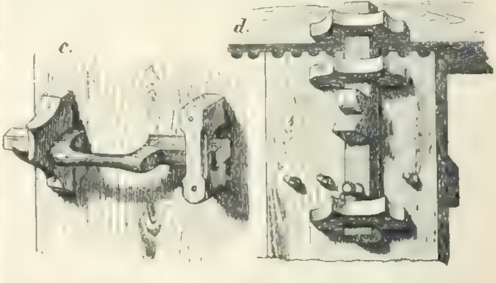
C. A crosspiece connecting the ribs of an arch centring.

BOLSTER WORK. A form of rusticated masonry in which the rounded projecting blocks or rustications bear a fancied resemblance to bolsters. (Rare.)

BOLT. A pin or rod used either to secure two or more parts or members permanently together; or movable, as for a temporary fastening; or fixed, to afford a more or less temporary support or means of attachment. More specifically:—

A. A pin or bar, generally of wrought iron or steel, to secure parts or members together, having a head worked on one end and a screw thread and nut at the other, or sometimes nuts at both ends. Distinguished from a rod as connecting two or more members in immediate contact, and, therefore, as being shorter.

B. A movable bar, rod, or similar piece for securing a door, window, or the like; whether made to slide horizontally or vertically; either in a case or sheath, or in three or more supports such as rings, or in a lock of which it forms the securing member. Distinguished from a bar as being smaller or of more elaborate and finished construction. Hence, such a member together with its case.



Bolt: with Rings and Door-pull, all of Wood, Swiss, 17th Century.

C. A pin, hook, or large screw driven or let into a wall, or the like, as a means—generally temporary—of support or suspension. Hardly to be distinguished from a spike or screw in the ordinary sense, except as being larger or of more elaborate form.

Barb Bolt. A bolt in sense *A*, of which the shaft is provided with barbs or sharp projections pointed toward the head of the bolt; thus permitting of ready insertion and, when driven, resisting an outward pull.

Barrel Bolt. A cylindrical bolt in sense *B*, made to slide in a case which is secured to the face of a door or sash by flanges. When shot, the end enters a corresponding case or a socket.

Carriage Bolt. A small bolt in sense *A*, having a domical or somewhat conical head, the other end being threaded for a nut.

Chain Bolt. A contrivance to secure a door, or the like, when ajar; consisting of a short chain permanently secured to the frame, its outer end being attached at will in a slot on the door so arranged that the chain cannot be detached from the outside by access through the opening.

Clevis Bolt. Same as Lewis Bolt (see subtitle below).

Dead Bolt. A simple form of lock consisting of a bolt shot or withdrawn by turning a knob, as distinguished from the commoner form of lock in which the bolt is actuated by a spring.

Double Ended Bolt. One having a thread and nut at each end.

Drift Bolt. A bolt in sense *A*, round or square, and about an inch thick, to secure together the successive layers of timbers in a grillage. — (F. E. K.)

Expansion Bolt. A bolt in sense *A*, arranged to screw into a shell divided longitudinally into two parts which spread laterally when the bolt is screwed into it, thus making a very close connection with the sides of the hole provided for it.

Eye Bolt. A bolt whose head is a fixed ring. (Compare Ring Bolt below.)

Fish Bolt. Any bolt to secure a fish or fishes.

Flush Bolt. A bolt in sense *B*, arranged to be sunk into the face of a door or sash so that the face of its case is flush with the surface.

Fox Bolt. A bolt secured by a Foxtail Wedge, which is forced into its inner end. (See under Wedge.)

Hook Bolt. One whose head forms a hook.

Lewis Bolt. One having a dovetail shank or shaft, flaring at its inner end, to be inserted in a hole of similar shape in stone or metal and secured by lead calking. Sometimes forming part of a Lewis.

Mortise Bolt. A bolt in sense *B*, arranged to be sunk in a mortise in the edge of a door or sash, so that the face of its case is flush with the surface of the edge.

Rag Bolt. Same as Barb Bolt (see subtitle above).

Ring Bolt. An Eye Bolt having a loose ring held by the eye. (Compare Eye Bolt above.)

Screw Bolt. A bolt with tapering point, having a screw thread, differing only by its larger size from a screw in the ordinary sense.

Sprig Bolt. Same as Barb Bolt (see subtitle above).

Spring Bolt. A bolt in sense *B*, which is shot, and retained in that position by a spring, which must be compressed, as by a knob, to allow the bolt to be withdrawn.

Stud Bolt. A bolt with a screw thread at each end — one for screwing into any fixed surface, the other having a stud or nut. — D.N.B.S.

BOLTEL. *A.* In mediæval architecture, a convex rounded moulding.

B. By extension from the above meaning, the coping of a convex rounded portion of the wall of a gable, generally forming a quadrant. In this sense also Bottle. — (A. P. S.)

BOLTON, WILLIAM; ecclesiastic and architect; d. 1532.

The prior of S. Bartholomew, London, is mentioned in the will of King Henry VII. as "Maister of the Works" of the chapel of the Virgin Mary, now called Henry the Seventh's Chapel, at Westminster Abbey, London. The actual prior at this time was William Bolton. It is extremely probable that he designed the chapel, although it has usually been credited to Sir Reginald Bray (see Bray, Sir R.). The first stone of the building was laid Jan. 24, 1503. The greater part of it was built in the reign of Henry VIII. (1491–1547). Stow calls Bolton a "great builder."

Brayley, *Historical and Architectural Account of Henry the Seventh's Chapel*; Stow, *Survey of London*.

BON. (See Bono.)

BONAFÉ, MACIAS (MATHIAS); architect and sculptor.

Bonafé constructed the lower stalls of the choir of the cathedral of Barcelona, Spain, in 1457.

Viñaza, *Adiciones*.

BONANNO (BONANNUS) of Pisa; architect and sculptor.

The great bronze doors of the cathedral of Monreale are signed "*Bonannus civis Pisanus*," with the date 1186. The doors which were made for the cathedral of Pisa in the latter part of the twelfth century are ascribed to him. Those of the front were destroyed in 1596 (see Bologne, J.). That of the transept remains. An inscription found in excavating at the base of the Leaning Tower of Pisa gives the name of "Bonannus," who is supposed to have been the architect of the building. His work appears to have been suspended at the third gallery on account of the increasing inclination.

Gravina, *Duomo di Monreale*; [illegible]; Rohault de Fleury, *Monuments de Pise*; Perkins, *Tuscan Sculptors*; Vasari, Milanesi, ed., Vol. I., p. 274.

BONAVENTURI, NICOLÒ DE'; architect.

Nicolò came from Paris, and was the first foreign architect employed on the cathedral of

Milan (Boito, 1889). He joined the works May 7, 1389. July 6 he was appointed *ingegnere generale*. He was chiefly occupied with the construction of the great piers, which were probably begun before he came to Milan.

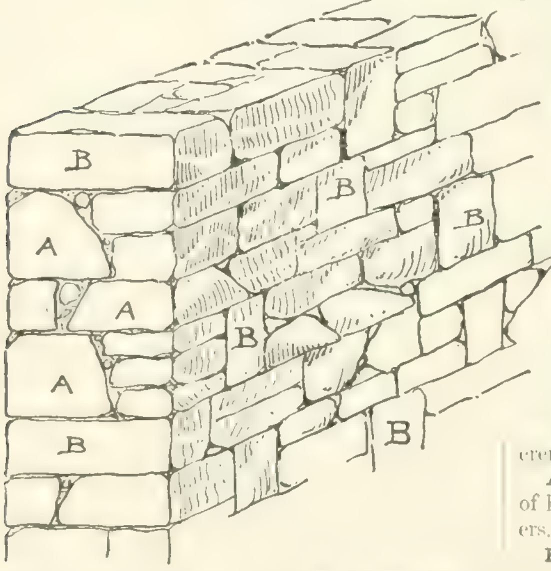
Boito, *Il Duomo di Milano*; *Annali del Duomo*.

BOND (n.). The connection of two or more parts or members which overlap and are made to adhere more or less closely; hence, a piece or pieces used for that purpose. Specifically:—

Bond as used in Early Stone Work of Syria.

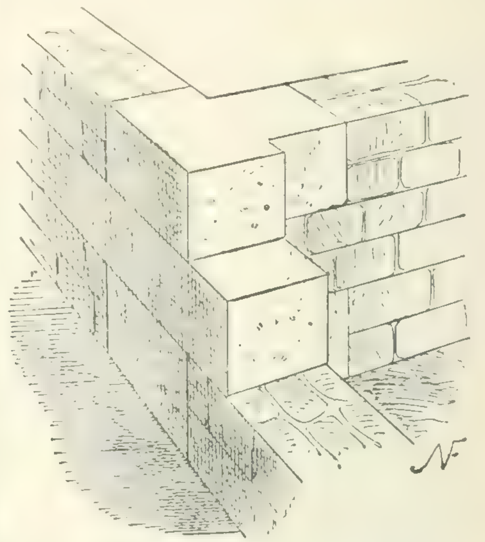
The [illegible] headers are through stones and form a heart bond with the stones [illegible] at the centre of the wall. There are also running bonds as shown at the face of the wall.

A. In carpentry, (1) the securing or framing of two or more timbers together by means of a third crossing them; (2) the timbers, considered collectively, placed in or on the walls, and which act to stiffen and bind the parts of a building, as wall plates, templets. — (N. E. D.)



Bond as formed in a Wall of Rough Stone; *B, B* being through Stones and *A, A* what are sometimes called "Three-quarter" Bond Stones. (See Heart Bond.)

B. In masonry, (1) the tie or binding of the various parts or pieces made by laying one piece across two or more pieces or parts; (2) a piece of material used for that purpose; hence, (3) the entire system of bonding or breaking joints as used in a masonry structure, for example, a wall may be said to be built in English bond. Incorrectly, the securing or holding together the parts of a masonry structure by the mortar or similar adhesive material.



Bond formed at the Junction of a Cross Wall with an Outer Wall, the Bond Stones being dressed to the Exact Thickness of the Walls, so that these Stretchers serve also as Perpends.

C. In roofing, (1) the amount by which one slate, tile, or shingle overlaps the second course below. (2) Sometimes the distance from the nail of one to the lower edge of the course above.

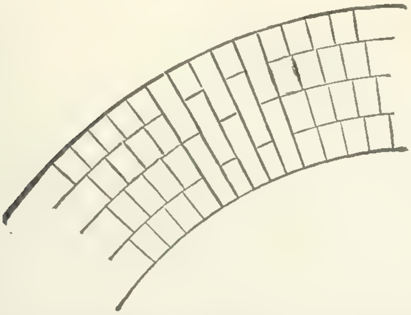
In bonding masonry, the following names are given to the various pieces of stone or brick: — *Binder; Header*, one laid lengthwise across a wall, generally perpendicular with the face. *Perpend*, in stonework, a binder extending entirely through, from face to face (French *parpaing*). *Stretcher*, one laid lengthwise parallel with the face. *Through*, same as perpend. The various systems of bonding are as given in the subtitles, in the definitions of which cross references have not been thought essential.

American Bond. In Brickwork, a course of headers to every five or six courses of stretchers.

Block and Cross Bond. In Brickwork, that which leaves the wall with one face in Block Bond and the other in Cross Bond.

Block Bond. Same as Flemish Bond.

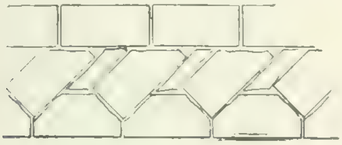
Block in Course Bond. In an arch built of otherwise unbonded concentric rings — as of rowlocks—a bond formed through the full depth of the archivolt by a block of bonded brick or by a voussoir inserted at intervals.



Block in Course Bond, formed by Five Courses of Bonded Brick to Tie Together the Four Concentric Rings of Rowlocks.

Chain Bond. Formed by building in the wall, longitudinally, a bar or strap of metal, or a timber.

Clip Bond. In Brickwork, a bond formed by *clipping* off the inside corners of face bricks laid as stretchers so as to form notches for the insertion of diagonal headers ; used the same as Split Bond, where it is desired to have the face composed entirely of stretchers.



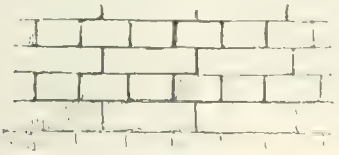
Clip Bond, formed at the Junction of the Diagonal Headers and the Face Bricks which have their Corners "Clipped."

These headers also form a diagonal bond. (See illustration of Plumb Bond.)

Common Bond. In the United States, same as American.

Cross Bond. (1) Courses of Flemish Bond alternating with courses of stretchers whose joints come opposite the centres of the stretchers in the second course above and below. (2) A modified English Bond, the successive stretching courses breaking joints with each other.

Diagonal Bond. Raking Bond, in which diagonal headers form continuous rows across the wall ; and are therefore commonly joined to the face bricks by Clip Bond.

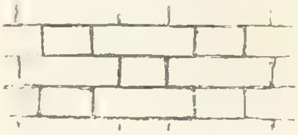


English Bond.

English Bond. Alternate courses of headers and stretchers.

English Cross Bond. Same as Cross Bond (2).

Flemish Bond. Headers and stretchers alternating horizontally and vertically, each header being centred with the stretchers above and below.



Flemish Bond.

Flying Bond. Formed by occasional headers at considerable intervals, in a wall formed mainly of stretchers.

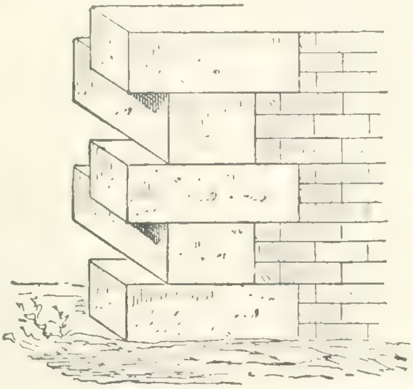
Garden or **Garden Wall Bond.** Same as Flying Bond ; so called because commonly used in thin boundary walls eight or nine inches thick.

Heading Bond. Formed by a course of headers, as in American or English.

Heart Bond. The bond formed where two headers meet at the centre of a wall, the joint being covered by a header above and below.

Herring Bone Bond. Raking Bond in which the rows of diagonal headers are laid at right angles, forming in plan a series of zigzags.

Hoop Iron Bond. Chain Bond formed by strap or hoop iron.

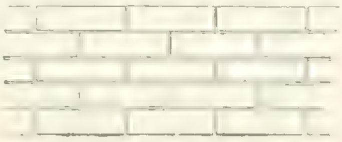


In-and-Out Bond, formed by a Vertical Series of Cut Stones inserted in a Brick Wall.

Here the headers are arranged to be [illegible] wall, which will thus be bonded to the wall [illegible].

In-and-Out Bond. That formed by headers and stretchers alternating vertically, especially when formed at a corner, as by quoins. (See Inbond ; Outbond.)

Plumb Bond. Same as Diagonal Bond.



Plumb Bond, the Result of Bonding the Face Brick as shown in the Illustration of Clip Bond.

[illegible]

Raking Bond. Formed by diagonal headers.

Ranging Bond. [illegible] bond formed by small strips of wood at the face of the wall, commonly laid in the joints, and projecting slightly to afford nailing to battens, furring, and the like.

Running Bond. Formed by two overlapping stretchers. American and English Bond are also frequently called Running Bond.

Split Bond. The face composed entirely of stretchers which are split lengthwise so that headers behind may lap the stretchers above and below, used in every fifth or sixth course to secure the face bricks; accomplishing the same result as a Clip Bond.

Timber Bond. Formed by a heavy timber, generally forming a Chain Bond.

Yorkshire Bond. Same as Flying Bond.

—D. N. B. S.

BOND (v.). To secure together the pieces of material composing a structure by the formation of one or more bonds, in whatever material. More commonly used of masonry.

BOND COURSE. A course of bond stones or headers in masonry; as the alternate courses of headers in English Bond. In ordinary American brickwork every sixth or seventh course is a bond course.

BONDER. A piece or member which bonds, especially in masonry. In stonework, more commonly called a Bond Stone.

BONDING COURSE. Same as Bond Course.

BOND STONE. In stone masonry, a stone whose longest dimension is laid transversely to the length of the wall. It commonly serves to bind or bond the facing to the backing or filling.

BOND TIMBER. A timber used in Timber Bond. (See Bond.)

BONE (v.). To determine or test by eye the evenness or regularity of a line, or of a series of lines or points, or of a surface; as, to sight along a series of rods which are adjusted so as to range, and on which a grade may be marked. Written also Born and Bourne.

BONE HOUSE. Same as Ossuary.

BONENSACK; architect.

April 20, 1207, a large part of the cathedral of Magdeburg, Germany, was destroyed by fire. The bishop, Albert II., a man of great culture and ability, began in 1208 the reconstruction of his church in the pointed style which was then replacing the round-arched or Romanesque style. The architect employed was one Bonensack, who is represented in a little figure which serves as a bracket supporting a three-quarters column in the nave of the church. His work is probably confined to the choir.

Brandt, *Der Dom zu Magdeburg.*

BONING ROD; BONING STICK. A stick with a crosspiece forming a head like the letter T, used to indicate a level (Knight). Spelled also Borning or Bourning (see Bone, v.).

BONINO DA CAMPIONE. Architect of the splendid monument of Cansignorio (d. 1375) near the *Arche dei Scaligeri* in Verona (1370). The work bears the inscription "*Hoc opus sculpsit et fecit Boninus de Campiliono.*" He was also employed on the cathedral of Milan in 1388.

Boito, *Duomo di Milano.*

BONNET. Same as Hood.

BONNEUIL, ÉTIENNE or **PIERRE**; architect.

Bonneuil worked on the cathedral of Notre Dame in Paris. In 1287 he went to Upsal in Sweden to build the church of the Trinity (cathedral) on the model of Notre Dame.

Lance, *Dictionnaire.*

BONO, BARTOLOMEO (BERGAMASCO); architect and sculptor; d. March 15, 1529.

Aug. 20, 1492, he was appointed *Proto al' Ufficio del Sale.* As such he must have been concerned in many public buildings erected in Venice about that time. The earliest work attributed to him is the great chapel or *tribuna* and two lateral chapels of the church of S. Rocco, built about 1495. In 1510 he built the upper part of the campanile in the Piazza di S. Marco (Müntz). He began the Scuola di S. Rocco in 1516, and had charge of the work there until June 3, 1524. He laid the foundation and built the hall in the lower story. He began the Procuratie Vecchie which was continued by J. Sansovino (see Sansovino). He was succeeded in his office of *proto* by Jacopo Sansovino at the same salary, 80 ducats a year. All the buildings mentioned are in Venice.

Paoletti, *Rinascimento in Venezia*, Vol. II., p. 275; Abate G. Nicoletti, *Illustrazione della chiesa e scuola di S. Rocco*; Muntz, *Renaissance.*

BONO, BARTOLOMEO DI GIOVANNI; architect and sculptor.

Bartolomeo Bono is the greatest of the sculptor-architects of the later Gothic period in Venice. He assisted his father (see Bono, G.) in his work on the façade of the Ca' d' Oro, begun in 1421. He is mentioned with him in the contract of Jan. 18, 1422, and elsewhere in the records of the building. He also appears in the contract of Nov. 10, 1438, between his father and the *Provveditori del Sale* for the construction of the Porta della Carta between the Doges' Palace and the church of S. Marco. This portal was called "della Carta" from the *carte* or notices posted there and "Porta dorata" from the gilding and colour employed upon it. It was finished in 1441. The relief of the tympanum of the great door of the Scuola di S. Marco is undoubtedly by Bartolomeo (Paoletti, Vol. II., p. 40). The Arco Foscari at the Doges' Palace is attributed to Bartolomeo, although documentary proof is lacking. Its statues are among the finest in Venice, and the peculiar use of Renaissance motives with Gothic details is very interesting.

Paoletti, *Rinascimento in Venezia*, Vol. I.; Cecchetti, *La Facciata della Ca' d' Oro*; Giacomo Boni, *La Ca' d' Oro e le sue Decorazioni Policrome*.

BONO (BUONO), GIOVANNI ("ZANE BON"); architect and sculptor.

Giovanni was the founder of an important family of Venetian architects and sculptors of the fifteenth century. The customary attribution to the Bono of the northwestern portion of the Doges' Palace, on the Piazetta, is without foundation in the documents. The *Domus Magna dei Contarini a S. Sofia*, now called the Ca' d' Oro on the Canal Grande, was begun in 1421. A copy of the contract, dated Jan. 18, 1422, between Marino Contarini and "*Zane Bon taiapiera*," for work to be done on this building still exists. Giovanni's name appears frequently in the Contarini records and other contracts. The chief work of the Bono is the Porta della Carta between the Doges' Palace and S. Marco. The contract made between Giovanni Bono and the *Provveditori del Sale*, dated Nov. 10, 1438, is given by Paoletti (op. cit., Vol. I., p. 37). His will is dated March 25, 1442. Other works in Venice are ascribed to him conjecturally. (See Bono, Bartolomeo).

Paoletti, *Rinascimento in Venezia*, Vol. I.; Cecchetti, *La Facciata della Ca' d' Oro*; Giacomo Boni, *La Ca' d' Oro e le sue Decorazioni Policrome*.

BONOMI, JOSEPH; architect; b. 1739 (at Rome); d. March 9, 1808.

Bonomi was Italian by birth and won considerable reputation in his own country. He was induced by the brothers Adam (see Adam, Robert) to come to England in 1767. He was a leader in the revival of Greek architecture in England. A list of his works is given in the *Arch. Pub. Soc. Dictionary*.

Leslie Stephen, *Dictionary of National Biography*; Gwilt, *Encyclopædia of Architecture*; *Arch. Pub. Soc. Dictionary*.

BONTEMPS, PIERRE; sculptor.

In 1552 he contracted with Philibert de l'Orme (see De l'Orme, P.) to make for the mausoleum of François I., at S. Denis, the bas-reliefs of the base and the kneeling statues of the queen, the dauphin and the Duke Charles d'Orléans. His reputation rests mainly on the brilliant execution of the bas-reliefs, which represent the military expeditions of the king. In 1556 payment was made to him for the beautiful marble vase with its pedestal, in the church at St. Denis, which was intended to contain the heart of François I.

Marquet de Vasselot, *Histoire des Sculpteurs français*; Palustre, *La Renaissance en France*; Marquis de Laborde, *Comptes des Bâtiments du Roi*.

BONUSAMICUS (BUONAMICO); sculptor.

An architrave with sculpture in the Campo Santo at Pisa, Italy, is signed Bonvsamicvs Magister. The same name is found in an inscription at Mensano, near Siena.

Da Morrona, *Pisa Antica* etc., p. 55; Vasari, Milanesi ed., Vol. I., p. 271.

BOOKHOLDER. (See Lectern; Reading Desk.)

BOOKSTACK. A fixed case fitted with a set of bookshelves, as for a library; especially one of a large and elaborate system of such sets of shelves in the stack room of a public library.

BOOKSTORE. *A.* In the United States, a place in which books are sold, usually at retail. In Great Britain, more commonly Bookseller's Shop.

B. In a large library, the room or rooms in which books are kept in quantity, and so arranged as to be easily reached by the attendants. (Compare Stack.)

BOOL WORK. Same as Boule Work.

BOONE (BOENE), CORNELIS; sculptor.

Boone was a Flemish sculptor who flourished in Ghent, Holland, in the middle of the fifteenth century. Ascribed to him are a costly tabernacle before the door of the S. Michielskerke in Ghent (1443); figures of angels before an altar in the same church; an altar-piece in the Predikheerenkerke at Ghent; and other work.

Immerzeel, *Hollandsche en Vlaamsche Kunstenaars*.

BOOTH. *A.* A dwelling house or hut of small size and humble character. (Compare Bothie.)

B. A temporary shelter, as of green boughs. (Compare Bower.)

C. A stall or enclosed stand, permanent or temporary, but not wholly enclosed except by movable shutters, or the like, and roofed or not, according as it is in the open air or within a larger building. (1) Such a stand in a market house, a temporary exhibition, a charity fair, or bazaar. (2) At an election, such a stand used by the agent who has charge of distributing the ballots, etc., of the candidate or party. (3) Also, at an election, the closet into which each elector goes to prepare his ballot and mark it, as in the Australian method of voting, and certain modifications of it. — R. S.

BORDER. Primarily, the edge or outer boundary of any surface, as of a nation's territory, or a wall or boundary. By extension, a band, stripe, rim, or margin which marks the outer edge of anything. In this sense, the borders of a flower garden are the strips of flower bed which are placed at its limits, as it is natural that such flower beds should be put under the shelter of the garden wall. In architectural use, the term is confined to [illegible] and chiefly to painted patterns. Thus, the paintings of Giotto and his assistants in the church of S. Francis at Assisi are surrounded by borders from 5 to 8 inches [illegible] terns of extraordinary beauty and variety. In the external decoration of the cathedral of Florence bands of inlaid marble are used with great effect, and such bands enclose and surround the surface of the gables which rise above the side doorways. The bands so used are borders, while those running horizontally and merely separating one part of the wall from another, are string courses or belt courses.—R. S.

BORDER STONE. Same as Curb Stone.

BORDER TOWER. (See Pele Tower.)

BORING. In preparations for building, a process of examining the soils or rocks beneath the surface where a building is to be erected. Boring is properly limited to the softer materials alone, such as sand, gravel, clay, and the like; but when a rock is struck it is drilled, and this is included in the general term. For the purpose of boring, different augers are used, even a common pump auger turned by a long bar screwed to its head and slowly moved by several men; but for a proper examination of the materials beneath the surface it is customary to use an auger working through a pipe which retains a core of the excavated materials in their original relative positions. If careful note is taken of the exact depth to which the pipes had been sunk when each separate sample of the soil was collected, a fair notion of the soils beneath can be obtained. (See Excavation; Foundation; Pile.) When a larger and a smaller pipe may be used together, the smaller one is put within the larger, and water is forced into the space between the two pipes; the materials below, if divisible and not too firmly indurated, are then washed up through the inner pipe and may be collected at the surface. —R. S.

BORN (v.). Same as Bone.

BORNING ROD. (See Boning Rod;—Stick.)

BOROMINO (BOROMINI). (See Borromino.)

BORROMINO (BORROMINI), FRANCESCO (the family name was originally Castelli); architect and sculptor; b. Sept. 25, 1599; d. Aug. 1, 1667.

His father, Giovanni Domenico Castelli, afterward called Borromino, was an architect in the service of the Visconti at Milan, Italy. Francesco studied sculpture at Milan and was first employed at Rome as a sculptor. He afterward entered the service of Carlo Maderna (see Maderna) as draftsman. He was associated with Bernini (see Bernini) in his work at S. Peter's and at the Palazzo Barberini. During the reign of Innocent X. (Pope 1644–1655) he superseded Bernini as architect of S. Peter's. His earliest important building is the curious church of *S. Carlo alle quattro fontane* (1640–1667), a good example of the fully developed baroque style in Rome. He built also the cupola and other portions of the church of S. Agnese in the Piazza Navona. About 1650 Borromino built the cloister and oratory of S. Filippo Neri. He built the Palazzo Falconieri with the interesting loggia overlooking the Tiber. He remodelled the Palazzo Spada, where he designed the curious perspective corridor. All the works mentioned here are in Rome. Borromino died by suicide.

Gurlitt, *Geschichte des Barockstils in Italien;* Ebe, *Spät-Renaissance;* Milizia, *Memorie;* Quatremère de Quincy, *La Vie et les Ouvrages des plus célèbres Architectes.*

BORSTLE. Same as Boltel.

BOSBOOM, SYMON; architect; b. about 1614; d. about 1670.

Symon Bosboom of Emden executed a great part of the sculptured decoration of the Hôtel de Ville at Amsterdam. (See Van Campen.)

Van Campen, *Stadthuis van Amsterdam;* Galland, *Der Holländischen Baukunst und Bildnerei.*

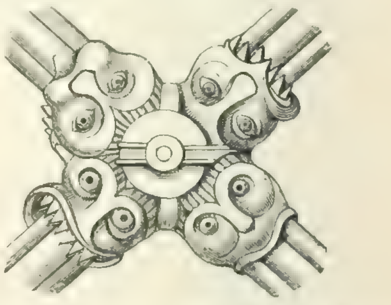
BOSIO, FRANÇOIS JOSEPH (Baron); sculptor and painter; b. Mar. 19, 1768 (at Monaco, France); d. July 29, 1845.

Bosio was a pupil of Pajou in Paris. He is especially known as the sculptor of twenty bas-reliefs for the Colonne Vendôme and the bronze quadriga of the *Arc du Carrousel*, Paris.

Dumont, *Discours prononcés aux funérailles de M. le Baron Bosio.*

BOSKET; also **BOSQUET**. In landscape gardening, a clump or cluster of trees or shrubs. This, in the French form, signifies originally a grove of some magnitude — large enough to contain a clear space within it which the foliage shelters from the wind and from the view of persons outside. Some of the French dictionaries limit its size to 30 or 40 metres. These dimensions are to be associated with the immense ornamental grounds of France; and in English use the term signifies rather a clump of three or four trees forming one of the elements of the landscape architect's composition. The form bosket is of the early eighteenth century.
—R. S.

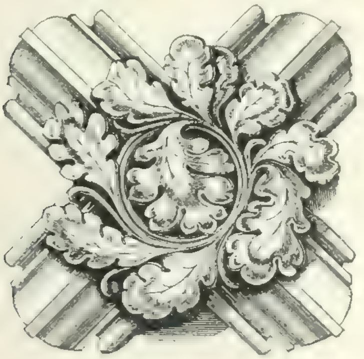
BOSS (I.). *A*. A projecting mass of stone, usually not large and commonly intended to be cut away after the completion of the work. (See Bossage.)



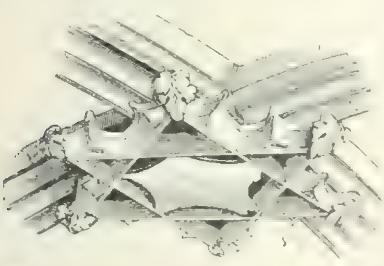
Boss, Church of Elkstone, Gloucestershire.

B. A mass projecting, as in *A*, but intended as a permanent feature; thus, in Gothic architecture, the moulded sill course of a window, or row of windows, is often terminated by sculptured projections of the sort. The most common use of the term is for the carved keystones of Gothic vaults. Where the different ribs meet at the top of the vault such a piece of stone (called by the French *clef*) is an almost essential feature, and this, if treated in a decorative way, is the boss. Those of the thirteenth century are sometimes of great richness. In later times they often took the form of the Pendant.—R. S.

Boss: Chapter House, Oxford Cathedral, c. 1250.



Boss: St. Alban's Abbey Church, Hertfordshire.



Boss: Church of Notre-Dame la Riche, Tours. 15th Century.

BOSS (II). A small trough or box used for mortar, as in roofing.

BOSS (III). Among builders, the master or employer. The word used alone has no other significance, but it is common to speak of the "boss of the job" in the sense of a workman who has the finer part of it in hand, or is temporarily in authority over other workmen and assistants.

BOSSAGE. Projecting blocks of stone or stone bosses considered as a feature of stone walling, as:—

A. The projecting stones of rusticated masonry; or,—

B. Masses or blocks left projecting in the rough during construction, to be afterward carved into their final decorative form.

BOSSE, ABRAHAM; painter, architect, engraver and etcher; b. 1611, (at Tours, France); d. Feb. 14, 1678.

Bosse was a pupil of the mathematician Desargues. At the formation of the *Académie Royale de Peinture* in 1648, he was made professor of geometry and perspective. As engraver he was especially interested in the representation of manners and customs. He published many works on architectural subjects: *Manière Universelle de Desargues pour la Perspective Pratique*, Paris, 1698, 8vo; *Moyen de pratiquer la Perspective sur les Tableaux et Surfaces irreguliers*, Paris, 1653, 8vo; *Manière de dessiner les Ordres d'Architecture*, Paris, 1664, folio; *Leçons de Géométrie et de Perspective, faites à l'Académie*, Paris, 1665, 8vo.

Valabrègue, *Abraham Bosse*; Bellier de la Chavignerie, *Dictionnaire des Artistes de l'École Française*.

BOTERELL, JOHN; architect.

Between 1397 and 1398, Westminster Hall, London, was repaired by King Richard II. (b. 1367; d. 1400), John Boterell being then "clarke of the works" (Stow, op. cit.).

Stow, *Survey of London*.

BOTHIE; BOTHY. In Scotch Lowland dialect, a hut, the term being connected with the word Booth. In common use it applies to a dwelling house of somewhat more comfort than the hut properly so called; it may be the dwelling of a Scottish farmer of some means (compare the similar change of meaning noted under Cottage).

BOTTEGA. In Italian, a shop; in the history of Italian art, the workshop in which an artist of reputation, having usually assistants, made and offered for sale, or made to order, decorative furniture, carvings, painted armorial shields, painted panels for chests, doors, shutters, tabernacles, shrines; and, in short, art works of any sort from mural paintings of importance to toys, weapons, utensils, etc. Each bottega gained a reputation for a peculiar class of work.

BOTTICHER, KARL; architect: b. May 29, 1806; d. June 21, 1889.

In 1832 he was appointed instructor in the Academy at Berlin, and in 1868 director of the sculpture gallery of the Berlin Museum. Bötticher published *Die Holzarchitektur des Mit-*

telalters, Bonn, 1835–1840, and the *Tektonik der Hellenen*, 1844–1852, 2d ed. 1869, his most important work.

Allgemeine Bauzeitung, 1889, p. 80.

BOTTLE. (See Boltel.)

BOTTOM (n.). The soil or other natural resisting material on which a building is founded, as at the bottom of an excavation or on which piles may bear.

BOTTOM STONE (n.). Same as Footing Stone.

BOUCHARDON, EDMÉ; sculptor and architect; b. May 29, 1698 (at Chaumont en Bassigny, France); d. July 27, 1762.

The son of Jean Baptiste Bouchardon, a sculptor and architect of Chaumont. Going to Paris, he entered the atelier of Guillaume Coustou (see Coustou, G.), and Sept. 18, 1723, won the *Grand Prix de Rome*. He spent ten years in Italy and returned to France in 1733. One of his best known works is the splendid fountain of the Rue de Grenelle, Paris. Bouchardon made the statue of Louis XV. which formerly stood where the *obélisque* now stands in the Place de la Concorde, then Place Louis XV., finished in 1757.

Mariette, *Abecedario*; Bellier de la Chavignerie, *Dictionnaire des Artistes de l'École Française*; *Musée de Sculpture du Trocadéro*.

BOUCHARDON, JEAN BAPTISTE. (See Bouchardon, Edmé.)

BOUCHER, FRANÇOIS; mural and decorative painter; b. Sept. 29, 1703; d. May 30, 1770.

Edmond et Jules de Goncourt, *L'Art du dix-huitième siècle*; Andre Michel in *La Grande Encyclopédie*; and, in the general bibliography, Mariette, *Abecedario*; and the dictionaries of painters.

BOUDOIR. In French, literally a pouting room. A private room attached to a lady's bedchamber; hence, any small private sitting room or reception room for a lady. (Compare Den.)

BOUDROT. (See Baudrot.)

BOULDER. A large, loose, or isolated stone, especially one rounded by the action of water or ice. In England, the name is often applied to pebbles or loose flints such as are used in some parts of the British Islands in laying up or facing walls. (See Cobble Stone.)

BOULE. (See Boulle, André Charles.)

BOULEUTERION. *A.* In Greek archæology, a place of assembly, especially for a public body.

B. In modern Greek, a chamber for the sittings of a legislative body, and also the building in which such a chamber is situated, as in the city of Athens, the capital of the kingdom of the Hellenes.

BOULEVARD. *A.* Originally, in French, a fortification; especially part of a large fortress, and usually the outwork. Hence, in later French usage, a considerable portion of the fortifications, as of a town. These ramparts, having been destroyed, either because the town had outgrown their circuit, or, because modern fortifications replace the ancient ramparts, or, finally, because the place was no longer to be a fortress, were replaced by promenades planted with trees and the like. Hence,—

B. In France, a wide avenue, especially one which has a general direction of former city walls, as encircling or partly encircling a town, as distinguished from one radiating from the centre toward the exterior; although this rule has by no means always prevailed. In the United States, a wide street or avenue of any sort, or, especially one planted with trees and intended to be an ornamental promenade.

— R. S.

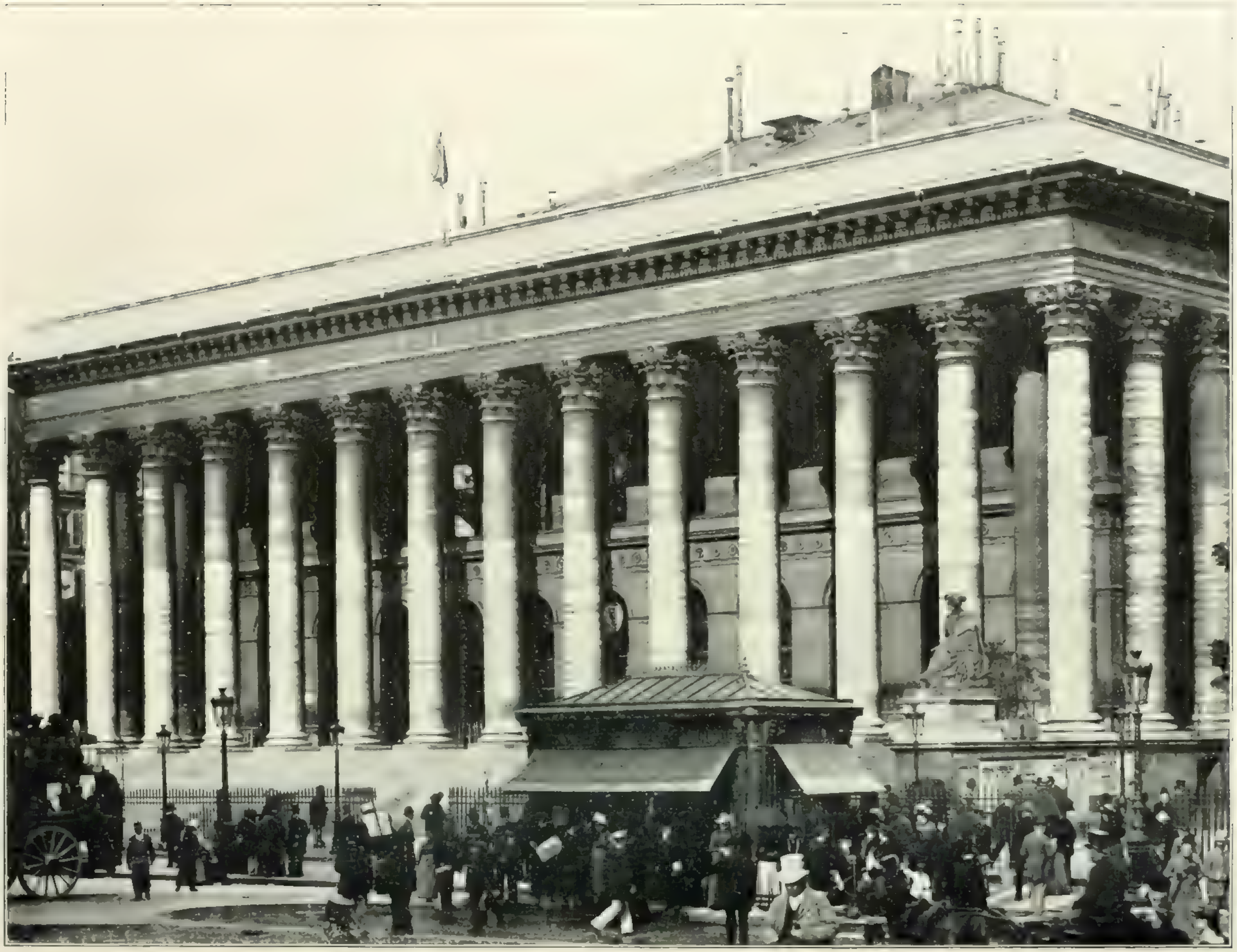
BOULE WORK. A method and style of furniture decoration introduced by A. C. Boulle, in France, during the reign of Louis XIV., and characterized chiefly by the use of inlays of metal (usually brass) and tortoise shell upon the flat surfaces of the cabinet work.

BOULLE (BOULE), ANDRÉ CHARLES; cabinet maker (*menuisier*), maker of inlaid work (*ébéniste*), and collector; b. 1642; d. 1732.

The earliest known Boulle was one Pierre, *tourneur et menuisier du roi*, who was lodged at the *Galerie du Louvre* in 1619. André Charles himself was the son of one Jean Boulle, *marchand ébéniste*, also established in the *Galerie du Louvre*. André received a broad artistic education, and entered his father's business. May 20, 1672, he also was admitted to lodgings in the Louvre. (The privilege accorded to certain eminent artists of lodging in the palace of the Louvre at the expense of the king originated with letters patent of Henry IV., dated Dec. 22, 1608.) The name of André Charles Boulle first appears in the royal accounts in 1669. After 1672 he was employed on important work at Versailles, of which records are found in the numerous inventories of the period. The designs for his work were frequently furnished by Jean Bérain (see Bérain), and sometimes by Charles Lebrun (see Lebrun). Of his creations, the most celebrated at the time were the decoration and furniture of the superb apartments of the Grand Dauphin, son of Louis XIV., at Versailles, finished in 1683. These pieces were dispersed soon after, and have disappeared. He was assisted and succeeded by his four sons, Jean Philippe, Pierre Benoît, Charles André, and Charles Joseph. (See Boule Work.)

Havard, *Les Boulle*; A. de Champeaux, *Le Meuble*; A. de Champeaux, *Dictionnaire des Fondeurs*; Havard, *Dictionnaire de l'Ameublement*; Dumesnil, *Histoire des plus célèbres Amateurs Français*; Williamson, *Les Meubles d'Art*; De Chennevières, *Archives de l'Art Français*.

PLATE IX



BOURSE

That of Paris; built under the first empire, from the designs of Brongniart. It was not used until after the Restoration. The mixture of styles, where an elaborate Corinthian colonnade encloses a building wholly arcuated, with its arches springing directly from imposts, is worthy of remark. The building is peristylar. The west or principal front and the south side are shown in the plate.

BOULLE, PIERRE. (See Boulle, André Charles.)

BOULOGNE, JEAN. (See Bologne, Jean.)

BOULTEL; BOULTINE. Same as Boltel.

BOUND MASONRY. Masonry which is properly bonded; that is, which has bonds, as under Bond, *B.*

BOUQUET. *A.* The floral or foliated ornament forming the extreme top of a Finial, Hip Knob, or the like.

B. Same as Anthemion, *B.*

BOURBON ARCHITECTURE. The architecture of the reigns of the Bourbon kings of France, 1590–1789.

BOURGEOIS, JEHAN; architect.

One of the architects of the dukes of Burgundy. In 1387 he was employed on the portal of the *Sainte Chapelle,* at Dijon (Côte d'Or, France), under Jacques de Neuilly. Dec. 9, 1404, he was made *maître général* of the ducal constructions, and from that time to 1417 worked on the fortifications of Dijon.

Laborde, *Les Ducs de Bourgogne*; Lance, *Dictionnaire.*

BOURNE (v.). Same as Bone.

BOURSE. In French, a building or room used for the meeting of persons who deal in merchandise of any sort; a merchants' exchange. In modern usage, more commonly limited to the business of buying and selling of public securities, stocks, and bonds, and in this sense adopted by the Continental nations under the forms *Boerse* in German, *Borsa* in Italian, etc., or in the unaltered French form. The Bourse of Paris is a building of some architectural pretensions, having a peristyle of sixty-four columns in the outer rows. (See Plate IX.) It was built between 1809 and 1825 under the direction of the architect Brongniart, followed by Labarre. That of Lyons, called also *Palais du Commerce et de la Bourse,* built by Dardel, about 1860, is a celebrated architectural composition.—R. S.

BOUTEILLER, JEAN LE; architect; d. before 1370.

In 1351 he finished the bas-reliefs of the choir of Notre Dame, Paris, begun by his uncle Jean Ravy (see Ravy). He probably also succeeded him as architect of the cathedral about 1345.

Bauchal, *Notre Dame et ses Premiers Architectes.*

BOUTEL. Same as Boltel.

BOW. A thin, flexible bar of wood or metal adjustable to any desired curvature by means of set screws, and designed for the laying out of large curves without having recourse to a centre. (See Curve.)

BOW AND STRING. In British usage, same as bowstring, in composition. (See Bowstring Beam, under Beam.)

BOW CHURCH. (See Church of S. Mary le Bow.)

BOW COMPASS. (See under Compass.)

BOWER. *A.* In the thirteenth century, and later, a chamber separated from the large room in which the members of the household commonly lived, and considered especially as the women's room; either as the retreat of the mistress of the house, or as a Gynæceum in general. (Compare House.) In the sense of a sleeping room or sitting room for the mistress of the house, the term remained in use down to the sixteenth century, as appears from its frequency in the English and lowland Scottish ballads. In this sense it is still in use in modern poetry.

B. By extension, and poetically, a small house, especially in the country; also a place of abode of any sort, as in such phrases "the bowers of Paradise," "bowers of bliss," and the like.

C. A shelter of trees or shrubbery, as in a garden; or simply a sheltered and quiet nook among trees and plants.—R.S.

BOWL. *A.* The surface of a sloping floor, as in an auditorium, constructed on a curve so that all points equidistant from a common centre are at the same level. It is commonly part of the surface of an inverted cone.

B. Same as Basin, *A.*

BOWL (v.t.). To construct a Bowl; to form with a bowl shape.

BOWLING ALLEY. *A.* Originally, an alley in a garden, enclosed by hedges or shrubbery, in which the game of bowls was played; or a bowling green, if long and narrow.

B. In the United States, a covered place and floor for the playing of the game called variously Tenpins, Ninepins, Bowling; and, rarely, American Bowls; in two senses, viz.: (1) The floor upon which the balls are rolled, a slightly raised long and narrow strip of carefully built and smooth wooden flooring, having on either side a sunken groove or gutter into which the balls will fall if not rightly directed, and behind the pins, when they are arranged in order for the game, a mattress or cushion to receive the blows of the heavy lignum-vitæ balls. There is usually a raised trough with a steep incline on one or the other side by means of which the balls are returned to the players. (2) The building erected, or the room arranged, for the alley in definition (1) and the players; usually a simple wooden structure with windows in either side, and especially strong light thrown upon the pins.

There are in the cities of the United States builders who make the fitting up of bowling alleys their especial business. The game was played formerly with nine pins, and now, since about 1850, with ten. The popular account of the matter is that laws were passed in some of the states forbidding ninepin alleys, which laws were evaded by increasing the number of the [illegible]. It is probable, however, that the arrangement in a single triangle rendered possible by the number ten was preferred to all other arrangements, and was the real reason for the change. — R. S.

BOWLING GREEN; GROUND. In garden architecture, a piece of lawn carefully planted, cut, and rolled in order to form a surface for playing some game of bowls; hence, is taken the mongrel French term *boulingrin*, which speedily lost all trace of the original signification of the English term, and grew to mean simply a piece of carefully kept lawn. The English term is sometimes used in a more general sense, especially in old formal gardens in England.

BOW PEN. (See Bow Compass, under Compass.)

BOW PENCIL. (See Bow Compass, under Compass.)

BOWTEL; BOWTELL. Same as Boltel.

BOW WINDOW. A bay window, the face of which is curved, giving a more or less bow-shaped plan. (See Bay Window; Oriel.)

BOX. A case, or a more or less enclosed recess or compartment, or a small independent structure, for the shelter, protection, or accommodation of persons, animals, articles, or materials. Specifically:

A. A receptacle for articles or materials, as coal, grain, letters, or the like; a box in the ordinary sense. Distinguished from a bin as having generally a cover, or as being smaller.

B. A more or less permanent structure to enclose and protect a part or parts of a construction, as the enclosure, commonly built of thin brick walls, to protect and afford access to a drain trap when laid below the cellar floor; or the recess forming part of a wooden window trim, into which the shutters are folded when not in use.

C. A compartment, or alcove, more or less enclosed and separated; especially: (1) In a theatre, or similar public place, such a compartment with seats for only a small number of spectators, generally more luxuriously appointed and commanding a higher price than the other parts of the house. (2) In an eating house, or the like, a compartment, generally enclosed by partitions on three sides, having a table and two or three chairs, or benches. (3) In a law court, the place, formerly enclosed, containing the jurymen's seats; the jury box. (4) In a law court, a witness stand, when more or less enclosed; the witness box. (5) In Great Britain, a square pew (N. E. D.). (6) A prison cell (N. E. D.). (7) In a stable, a compartment larger than a stall, in which a horse may move about; more specifically, a loose box or box stall.

D. A small shelter for one or more persons engaged in specific duties; as, in military usage, a small movable wooden hut to afford shelter for a sentry, often somewhat elaborately decorated with the national colours: a sentry box; a house, now generally of iron, and frequently comparatively large, to accommodate the operators of switches or signals on a railway: a signal box.

E. A small and comparatively unpretentious country house, for the temporary use of sportsmen; as a shooting box, a fishing box. — D. N. B. S.

BOX BED. *A.* A bed enclosed by wooden sides and top, the front being made to open and close by means of shutters or doors. Common in Scotland. — (N. E. D.) (Compare Bed Place.)

B. Sometimes, a bed that folds up in the form of a box.

BOX COIL. A steam, or hot water coil, consisting of a series of iron pipes connected vertically and horizontally by return bends and forming a stack of somewhat cubical shape. (See Ventilation; Warming.)

BOX OFFICE. In a theatre, the office where tickets of admission are sold.

BOX SCENE; BOX SET. In a theatre, or similar place of entertainment, a scene consisting of a back scene joined at its ends to two side pieces extending nearly to the front of the stage. Commonly, also, provided with a ceiling.

BOX STALL. (See Box *C*, 7.)

BOYFIELD, JOHN; ecclesiastic and architect; d. 1381.

Abbot of Gloucester, supposed to have built the vaulting of the choir of the cathedral of Gloucester, England, about 1350.

Britton, *Architectural Antiquities*.

BOYLE, RICHARD, third Earl of Burlington and fourth Earl of Cork; amateur and architect; b. April 25, 1695; d. Dec. 4, 1753.

Richard Boyle succeeded to his father's titles and estates in 1704. Oct. 9, 1714, he became a member of the Privy Council, and August, 1715, was made Lord High Treasurer of Ireland. He grew up under the influence of Sir Christopher Wren (see Wren), spent several years in Italy, and became an enthusiastic admirer of Palladio (see Palladio). He was a skilful architect and had a strong influence upon the architectural work of his time. In 1716 he undertook the reconstruction of the family mansion, Burlington House in Piccadilly, London, which was originally built by his great-grandfather, the first earl. Walpole attributes the fine colonnade of the court to Burlington himself. In 1730 he rebuilt his villa of Chiswick from a design suggested by La Rotonda of Palladio, and laid out the park in the Italian style. Burlington designed General Wade's house, Cork Street, London (destroyed), a dormitory for Westminster school, London, and the Assembly Rooms at York. His principal helper was William Kent (see Kent), who lived at his house until his death in 1748. Burlington spent much of his wealth upon the preservation and restoration of important public monuments, among others the church in Covent Garden, London, designed by Inigo Jones (see Jones, I.). He bought in Italy many of the original designs of Palladio, which he published under the title *Fabriche Antiche*, London, 1730, 1 vol., folio.

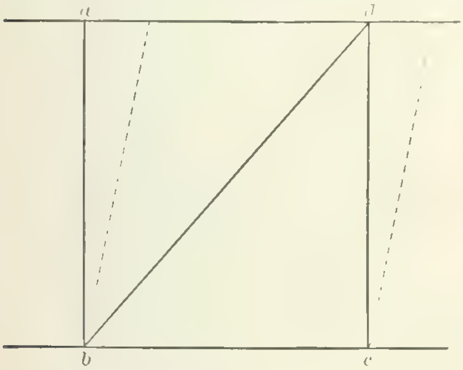
Walpole, *Anecdotes of Painting*; Redgrave, *Dictionary of Artists*; Stephen, *Dictionary of National Biography*; Campbell, *Vitruvius Britannicus*.

BRACCIALE. In Italian art, a bronze or iron standard for a torch or for a flagpole or the like; as frequently seen on the exterior of Tuscan palazzi.

BRACCINI, NICCOLÒ DEI. (See Tribolo.)

BRACE. A piece or member, generally long as compared to its lateral dimensions, used to stiffen or steady another member or structure; specifically: —

A bar introduced into a framework to prevent distortion or change of shape, usually a diagonal in a quadrilateral. It may act either by tension or by compression. The quadrilateral *abcd* may change its shape by the rotation of its sides about the joints. If the rigid diagonal brace *bd* is introduced and firmly attached, deformation is rendered impossible except by rupture of the parts.



BRACE.

If the rectangle is exposed to deforming forces in two directions, *i.e.*, to the right or to the left in the diagram; a single rigid brace firmly attached to the frame will prevent change of shape, but it is customary in such case to introduce two diagonals, both ties or both struts or compression members, as the case may be; which facilitates construction. If the four sides of the quadrilateral are rigid members, the diagonals will be ties. If two of the opposite sides are tension members, the braces will be struts.

W. R. Hutton.

Angle Brace. A brace set across the corner of a more or less rectangular structure, as at the corner of a frame house.

Batter Brace. The inclined braces at the end of a truss, as of a Pratt truss.

Counter Brace. In a truss an extra or supplementary brace crossing the main brace. It is introduced in those panels which are exposed to change of shape in two directions.

Portal Brace. In ironwork, a brace approaching the form of a knee inserted in the angle between a vertical and a horizontal member to resist lateral pressure. Being commonly bent approximately to a quarter-circle, a pair of them, placed so as to face each other, will produce the effect of an arched portal.

Principal Brace; Principal Sway Brace. A brace to stiffen a principal rafter or its supporting structure; as, especially, in the angle between a tiebeam and its end-support.

Purlin Brace. In carpentry, a brace from a roof truss to relieve or stiffen a purlin between its bearings upon the principals.

Sway Brace. A brace inserted to prevent sideways motion, as under the influence of wind; therefore, usually horizontal in position or in the plane of the main structure. This term, common in bridge building, is rare in architecture.

Wind Brace. A sway brace designed primarily to resist the lateral action of wind.

BRACHADICZ, PETER VON; architect.

Peter von Brachadicz worked on the spire of the church of S. Stephen in Vienna, Austria, until 1429. His successor, Hans von Brachadicz, completed the spire in 1433.

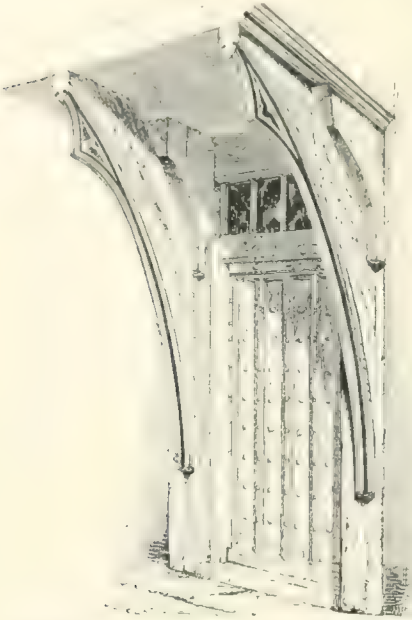
Tschischka, *S. Stephans Dom*; Tschischka, *Geschichte der Stadt Wien*.

BRACING. The operation of strengthening a framed or other structure by means of braces; or any system or aggregation of braces. The general principle upon which bracing depends for its efficiency is that of the triangle, whose shape cannot be changed without breaking, bending, or altering the length of one or more of its sides. (See Brace; Carpentry; Construction; Truss.)

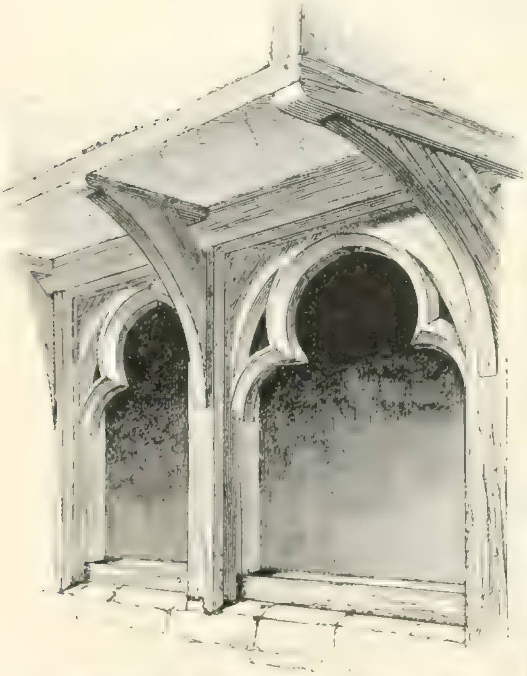
Cross Bracing. *A.* Any system of bracing with crossed struts or ties, as in many bridge trusses.

B. In house carpentry, the term is used specifically for continuous lines of crossed braces or struts between the floor joists, these lines of cross bracing being put in at intervals of 6 or 8 feet to stiffen the floors by distributing over several joists any shock or strain upon one. Generally called Bridging, and Cross Bridging or Herringbone Bridging (which see, under Bridging).

BRACKET. A member prepared for carrying a weight which overhangs or projects, as a projecting story of a building, or a shelf. This is the general term; and although it would not be applied, often, to a cantilever, a corbel, a *cul-de-lampe*, or a modillion, except carelessly, it covers all varieties which have no specific names of their own. The common shelf bracket of modern times is a light piece of castiron, sold in shops. The action of the bracket is twofold: it pulls outward along the line of the horizontal top bar or edge, and presses inward more solidly at the foot. If, therefore, a bracket is secured to a wall along the whole height of its vertical member, the more the horizontal member above is loaded, as with a balcony, bay window, or the like, the more of a pull is exercised upon the wall immediately below this projecting member. This may even become dangerous; and it is, therefore, customary to make the bracket a part of a floor or other horizontal member which can resist a strong outward tendency.

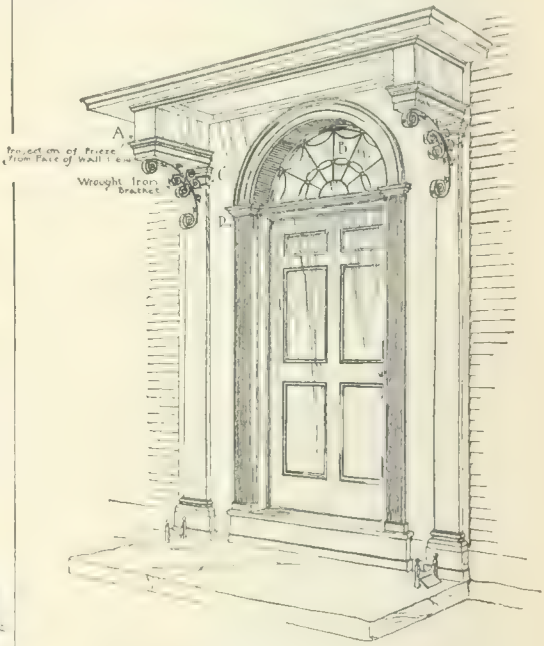


Brackets carrying Projection of Upper Story; House at York, 14th Century.



Brackets in the Old Cloisters, Windsor Castle.

The term is applied also to small movable objects which project from walls so as to resemble distantly the architectural bracket. Thus, a gas fixture for a wall opening, and, equally, a support for a bust, or vase, hung upon a hook, receives the name. (See Mutule; Torsel.) — R.S.



Brackets carrying Porch-roof; Arnold House, Charlestown, Mass.

BRACKETING. A system or series of brackets; or the operation of setting or providing brackets.

BRAMANTE (DONATO D'AGNOLO), incorrectly called Bramante Lazzari; b. about 1444; d. Mar. 11, 1514.

The surname Bramante comes from *bramare*, to desire ardently, doubtless derived from some family peculiarity. Donato, the son of Angelo, was born at Asdrualdo, near Urbino, Italy. There is no proof that he assisted Luciano da Laurana (see Luciano da Laurana) on the palace of Urbino, but the influence of that work upon his style was very great. He began as a painter, and according to Fra Castiglione had for teachers Piero della Francesca and Mantegna (see Mantegna). In 1477 he decorated the palace of the Podestà at Bergamo, Italy, and there are still fragmentary frescos in Lombardy which are ascribed to him. He appears to have gone to Milan about 1472 (V. Geymüller, *Les Proj. prim.*, p. 28) in the reign of Galeazzo Maria Sforza (b. 1468; d. 1494), and to have remained there until the fall of the Sforza dynasty under Lodovico Sforza (*il Moro*, b. 1451; d. 1508).

Bramante's Milanese differs so much from his Roman work that it has been ascribed to a fictitious "Bramante of Milan" (Von Seidlitz, op. cit., p. 183). He built at the church of S. Maria presso S. Satiro the transept with its curious apse in perspective low relief, and the famous sacristy. (For the sculpture, see Ambrogio Foppa.) He appears in the records of the "Canonica" (the interesting cloister of S. Ambrogio) in 1492 as director of the works. He is supposed to have worked on the *Ospedale Maggiore* (see Filarete). Bramante's chief work at Milan is the dome and sacristy of S. Maria delle Grazie (1492). The lower parts of that building show his influence especially. June 27, 1490, he made an interesting report, which has been preserved, on the competition for the central tower of the cathedral (V. Seidlitz, op. cit., p. 199). Of his buildings near Milan the most important is the façade of Abbiategrasso, dated 1477, which suggests the "Nicchione" of the Belvedere Vatican. He probably planned the cathedral of Pavia (Malaspina, op. cit.) and perhaps the nave of the cathedral of Como.

Bramante seems to have settled in Rome after the capture of Milan by Louis XII., Oct. 6, 1499. The classic surroundings developed at once an entire sympathy with antique style and proportion. This is shown in his first building, the *Tempietto* of S. Pietro in Montorio, finished before 1502. (The upper part was added later.) The Cancelleria is commonly ascribed to Bramante, but the façade bears the dates 1489 and 1495, and it was undoubtedly begun by the Cardinal Raffaello Riario as early as 1486. Vasari's words "*rizoluzione di gran parte*" may refer to extensive additions by Bramante. The case of the Giraud Torlonia palace, a replica of the Cancelleria, is similar. In the letter of gift of this palace to Henry VII. of England, dated March, 1504, it is described as "*nondum perfecta*" (D. Gnoli, op. cit., p. 183). Bramante built the cloister of S. Maria della Pace in 1504. The immense palace which he built "*presso San Biagio*" for the offices of Julius II. was famous for its magnificent use of rustication. A few fragments remain in the Via Giulia (Redtenbacher, op. cit.). He began the Santa Casa and the palace at Loreto (see Sansovino, A.). One of Bramante's most interesting works was the palace bought by Raphael in 1517 and preserved to us by a sketch of Palladio. Bramante does not appear at the Vatican until the reign of Julius II. (Pope 1503–1513) who wished to unite the old Vatican with the Belvedere of Innocent VIII. (Pope 1484–1492). Bramante planned an immense quadrangle, the shorter sides formed by the two palaces and the longer by galleries copied from the theatre of Marcellus. This court led by three levels up to a great apse, the *Nicchione* of the Belvedere. He finished the eastern gallery only. In the old Vatican Bramante built the *loggie* which received Raphael's decorations (see Santi, R.). The reconstruction of the Basilica of Constantine (S. Peter's) was attempted in the reign of Nicholas V. (Pope 1447–1455). (See Alberti and Rossellino, B.) And again in the reign of Paul II. (Pope 1464–1471). Julius II. resumed the work April 18, 1506, and placed it under the direction of Bramante. At his death the four piers of the dome had been raised to the cornice and the apse opposite the main entrance had been vaulted. His design was a Greek cross with towers in the open angles and a central dome. A complete table of the works attributed to Bramante is given in Von Geymüller (*Les Projets primitifs*, p. 103). Bramante is supposed to have been *analfabeto* (illiterate), but there are several sonnets and other poems and some fragments of manuscripts which are attributed to him.

Von Geymüller, *Les Projets primitifs*; Von Geymuller, *The School of Bramante*; D. Gnoli, *La Cancelleria*; Von Seidlitz, *Bramante in Mailand*; Muntz, *Renaissance*, Vol. 2; Vasari, Milanesi ed.; Vasari, Blashfield-Hopkins ed.; Pungileoni, *Memorie*; Casati, *I Capi d' Arte di Bramante*; H. Semper, "Donato Bramante" in *Dohme Series*; L. Beltrami, *Bramante Poeta*; Letarouilly et Simil, *Le Vatican*; Castiglione, *Ricordi*; Cassina, *Fabbriche di Milano*; Malaspina, *Cattedrale di Pavia*; Redtenbacher, *Der Palazzo di S. Biagio*.

BRAMANTESCO; -ESQUE. Having to do with Bramante, the celebrated architect of the Renaissance, and with the style of building and decoration largely introduced by him. (See Italy, Part III., Lombardy, where it is pointed out that the term is still in use in Italy as applied to architecture of a certain stamp.)

BRAMANTINO. (See Suardi, Bartolomeo.)

BRANCH. *A.* A member or part of a system or structure which diverges from the main portion; especially in heating, ventilation, plumbing, and the like, a smaller or subordinate duct or pipe extending from the main line for whatever purpose. Hence,

B. A piece of piping having two or more arms by which a branch in the sense *A* is connected with another or with the main line.

T Branch. One having an arm at right angles with the main part, giving three openings.

Y Branch. One having an arm at an oblique angle with the main part, giving three openings. — D. N. B. S.

BRANDER (v.). To apply battens or furring strips to the under sides of joists preparatory to lathing for the plastering of a ceiling.

BRANDIN, PHILIP; sculptor and architect.

Philip Brandin of Utrecht (Holland) between 1576 and 1586 built the monuments of the princes of Mecklenburg on the north side of the choir of the cathedral of Güstrow (Mecklenburg, Germany). With Conrad Floris, also a Netherlander, he was employed by the Duke Johann Albrecht at Schwerin (Mecklenburg).

Lübke, *Geschichte der Renaissance in Deutschland*.

BRANDON, JOHN RAPHAEL; architect; b. 1817; d. 1877.

John Brandon was articled to W. Parkinson, architect, in 1836, and, with his brother, Joshua Arthur, established an office in London. The brothers Brandon were especially students of English Gothic architecture, and are best known by their books: *Parish Churches*, London, 1848, 1 vol., 8vo.; *Analysis of Gothic Architecture*, London, 1847, 2 vols., folio, and *Open Timber Roofs of the Middle Ages*, London, 1849, 1 vol., 8vo.

Stephen, *Dictionary of National Biography*.

BRANDON, JOSHUA ARTHUR. (See Brandon, John Raphael.)

BRASS. *A.* A mixed metal; an alloy of copper with zinc, in about the proportion of forty-five parts of zinc in the hundred, by weight. (See Metal Work.)

B. With the article, same as Memorial Brass.

BRASS WORK. (See Metal Work.)

BRATTICE; –ING; –ISHING. *A.* In mediæval architecture, a temporary wooden parapet, breastwork, or gallery erected on a fortification for use during a siege.

B. An ornamental openwork, as a cresting, or the like, especially over a shrine. In this sense generally written in the third form.

C (loosely and without good authority). A wooden enclosure of any sort, as light boardwork, connected with and generally projecting from a more massive building. Thus, the wooden balconies and overhangs of some mosques and other buildings of the Levant are called by this term, apparently for want of another which would be more accurately descriptive.

BRAUN, MATTHIAS VON; sculptor and architect; b. 1684 (at Innsbruck); d. Feb. 15, 1738 (at Prague).

Braun commenced the practice of sculpture while quite young, and at the age of sixteen went to Italy, where he formed himself on the work of Bernini (see Bernini). In 1705 he was called to Bohemia by the Count Franz Anton Spork, and employed by him on his residence at Graslitz for several years. His work included bas-reliefs and colossal statues cut in the native rock. In 1720 he went to Prague, and was later established in Vienna as court sculptor by the Emperor Charles VI.

Pelcel, *Abbildungen Böhmischer Gelehrten und Künstler*; *Allgemeine deutsche Biographie*.

BRAY, SIR REGINALD DE; statesman and architect; d. 1503.

Reginald was the second son of Sir Richard de Bray, privy councillor to Henry VI. He became a favourite of Henry VII., and retained his confidence until his death. He succeeded Richard Beauchamp (see Beauchamp, R.) as master of the works at S. George's Chapel, Windsor, in 1481, and built his private chapel in the south aisle of this building. Sir Reginald de Bray was present at the laying of the corner-stone of Henry the Seventh's Chapel at Westminster Abbey, Jan. 24, 1503. The design of that building has been attributed to him, but that honour probably belongs to William Bolton (see Bolton, W.).

Britton, *Architectural Antiquities*; Brayley and Neale, *Abbey Church, Westminster*.

BRAY, SALOMON DE; architect, painter, and poet; b. 1597 (Haarlem, Holland); d. 1664.

Salomon de Bray made a model for a church in Haarlem, Holland, and a plan for the enlargement of that city. There are pictures by him in the *Oranien Saal* at The Hague, and at Dresden. In 1627 he published a volume of poems at Amsterdam.

Seubert, *Künstler-lexicon*.

BRAYLEY, EDWARD WEDLAKE; antiquary and topographer; b. 1773; d. 1854.

As a boy he formed a close intimacy with John Britton (see Britton, J.), and was associated with him in many of his principal antiquarian undertakings. He wrote the text of Neale's *History and Antiquities of the Abbey Church, Westminster.* A list of his works is given in Stephen (op. cit.)

John Britton, *Autobiography*; Leslie Stephen, *Dictionary of National Biography*.

BRAZIL, ARCHITECTURE OF. (See South America, Architecture of.)

BREAK (n.). A change in the continuity of a surface or member. Thus, a projecting chimney breast forms, on either side, a break in the wall.

BREAK (v.). In architecture and building, mainly in composition; as, To Break Back, to return (as a wall, etc.) inward from a projection, the reverse of to break out (which see below); To Break Ground, to begin an excavation, as by making the first cuts with the spade, (see Turn the First Sod, under Sod); To Break Joints, to have such a disposition of solids (as bricks or stones) that each piece laps over two pieces adjoining above and below, so that no joint is continuous; To Break Joints (transitive), to dispose solids as above; To Break Out, to project at a right angle or nearly so, as a chimney breast from a wall.

BREAKFAST ROOM. A small room for the morning meal; usually, but not always, adjoining the chief dining room; and in northern climates often specially arranged with an eastern exposure to catch the morning sun.

BREAKING IN. The cutting of holes or recesses in brickwork or masonry to receive the ends of beams, wooden plugs, or the like.

BREAST. *A.* The projecting portion of a chimney, especially when projecting into a room or other apartment.

B. The under side of a hand rail, beam, rafter, or the like. (See Back.)

C. That portion of a wall which is between a window sill and the floor. (Compare Allege; Spandrel Wall.)

BREAST SUMMER. A Summer or beam serving as a girder or lintel over an opening to support the wall above, or other superstructure.

BREAST WALL. (See Retaining Wall.)

BRÉBION MAXIMILIEN; architect; b. 1716; d. 1796.

Brébion won the *grand prix d'architecture* in 1740, and was admitted to the *Académie d'Architecture* in 1755. In 1781 he replaced Soufflot (see Soufflot) as architect of the Panthéon at Paris, and finished the cupola. He restored the *Observatoire* in Paris (1786), and built the vestibule of the *Institut* on the side of the *Pont des Arts*.

Lance, *Dictionnaire*; Bauchal, *Dictionnaire*.

BRECCIA. (See Breccia Marble, under Marble.)

BREGNO, ANDREA, OF OSTENSO (ANDREA MILANESI); sculptor and architect; b. 1421; d. 1506.

In the church of S. Maria Sopra Minerva at Rome is found an obituary inscription with the name Andrea Bregno, and the date 1506. This Andrea Bregno, who is not to be confounded with Antonio Bregno surnamed Rizzo (see Rizzo), is supposed to be the sculptor of the altar of the Cardinal Rodrigo Borgia at the church of S. Maria del Popolo (1473), the Ferrici monument at the church of S. Maria Sopra Minerva, a part of the Roverella monument at the church of S. Clemente in Rome (both after 1476), a part of the monument of Cardinal Cristoforo Rovere at S. Maria del Popolo in Rome (after 1479), and the great Piccolomini altar at the cathedral of Siena, built for the Cardinal Federigo Piccolomini.

August Schmarsow, *Meister Andrea*; Milanesi, *Documenti*; Geymuller-Stegmann, *Die Arch. der Ren. in Toscana*; Gaye, *Carteggio*.

BREGNO, ANTONIO (of Como). (See Rizzo, Antonio di Giovanni.)

BRENTANO, GIUSEPPE; architect; b. about 1860; d. 1890.

Giuseppe Brentano, a pupil of Luca Beltrami in Milan, won the competition for a new façade of the cathedral of that city, and had begun the model for it when he died. He was a pupil of the Polytechnic School at Milan, and after winning the competition entered the atelier of Baron Hasenauer (see Hasenauer) in Vienna, to study Gothic architecture.

American Architect, Vol. XXVII., p. 130; Brentano, *Concorso per la Nuova Facciata del Duomo di Milano.*

BRERA. (Properly, the palace of the Brera or di Brera; so called from the flat land outside the ancient city on which it was built.) A building of the seventeenth century, formerly occupied successively by different religious orders, but since the close of the eighteenth century used for learned societies and especially for an important museum of sculpture and painting; in Milan, Italy.

BRESSUMER; BREST SUMMER. Same as Breast Summer.

BRETÈCHE; BRETESSE. Same as Brattice, *A.*

BRETON, GILLES LE; architect; d. 1552.

Three architects of this name, probably brothers, appear in France during the first half of the sixteenth century. Gilles le Breton was charged with the transformation of the château of Fontainebleau (Seine et Marne, France), probably from the commencement of the work about 1528 until his death in 1550, and to him are due the most interesting parts of that building. He built at Fontainebleau, about in the order given, the pavilion of the *Porte Dorée* with the buildings near it in the *Cour Ovale* and the so-called gallery of François I.; in the main structure of the *Cour du Cheval blanc*, the chapel of la Trinité and the *rez-de-chaussée* of that portion nearest the pool; and, later, in the *Cour Ovale*, the *Tour du Peristyle*, the chapel of S. Saturnin, and the great hall called the *Galerie Henri II.* The splendid wooden ceiling of the *Galerie Henri II.* is the work of Philibert de l'Orme (See De l'Orme, Philibert), who succeeded Le Breton as architect of the building in 1550.

These statements are made on the authority of Léon Palustre (op. cit.). His attribution of the château of Fontainebleau to Gilles Le Breton appears to be the only one warranted by existing documents.

De Laborde, *Comptes des Bâtiments du roi*; Palustre, *La Renaissance en France*; Palustre, article *Le Breton* in *La Grande Encyclopédie*.

BRETON, GUILLAUME LE; architect; d. 1550.

Guillaume and Jacques (d. 1550) le Breton appear to have been associated in their work. In 1532 and again between 1541 and 1550 they were employed in the construction of the château of Villers Cotterets (Aisne, France). They were probably brothers of Gilles le Breton.

For bibliography, see Breton, Gilles le.

BRETON, JACQUES LE. (See Breton, Guillaume le.)

BREWERY. A building or group of buildings arranged for the purpose of carrying on a brewer's business.

George Ehret, *Twenty-five Years of Brewing, with an Illustrated history of American beer;* Philipp Heiss, *Die Bierbrauerei mit besonderer Berücksichtigung der dickmaisch Brauerei*, München, 1853; Gustav Noback, *Bier, Malz, sowie Maschinen und Apparat für Brauereien und Malzereien;* W. J. Sykes, M.D., *Principles and Practice of Brewing; Short Account of Allsopp's Breweries, Burton-on-Trent;* Emil Struve, *Die Entwickelung des Bayerischen Braugewerbes im neunzehnten Jahrhundert.*

BREWHOUSE. An establishment for brewing ale and beer, in connection with a large dwelling house in the country. It is thus distinguished from a brewery, where malt liquors are manufactured for the trade. (English usage. The brewhouse is practically unknown in the United States.)

BRICK. *A.* A regularly shaped piece of clay hardened in the sun or by the heat of a kiln and intended for building; commonly one of very many pieces of uniform size. The term is usually limited to pieces of clay not very thin and flat, which latter are called tiles; the ordinary brick are, as in parts of the United States, about $2\frac{1}{2}$ by 4 by 8 inches, or, as in parts of Europe, about $2\frac{5}{8}$ by $4\frac{3}{8}$ by 9 inches. Bricks made for facework, as it is called, that is to say, the smoother and more elegant facing of the exterior of a wall, are made of many shapes and colours and commonly laid with mortar joints much smaller than those between the common bricks in the same wall. Moulded bricks are made in a great number of patterns, and so arranged as to form, when laid up in the wall, continuous lines of moulding, curves of an arch, and the like, or patterns in relief, and even to the extent of having a raised leafage or the like upon their faces.

B. The material, baked clay, in small pieces in a general sense. (See Brickwork; Masonry.)

The various kinds of brick are given in the subtitles, in the definitions of which cross references have not been thought needful. — R. S.

Air Brick. A hollow and pierced brick or piece of hard material, about the size of a brick, built into a wall with ordinary bricks to allow the passage of air.

Angle Brick. A brick shaped to any oblique angle; especially one made to fit an oblique, salient corner, as in a polygonal building.

Arch Brick. *A.* Generally a wedge-shaped brick for a voussoir of an arch.

B. A brick from the arch of a brick kiln, usually more thoroughly burned and harder, and therefore regarded as more valuable for certain kinds of work.

Ashlar Brick. Brick made especially for the facing of walls in expensive and decorative work, and intended to resemble ashlar. A common form has a very rough finish, so as to resemble rock-faced stone. (See Face Brick, below.)

Clinker Brick. A very hard-burned brick, so called from its metallic sound when struck. Hardly to be distinguished from Arch Brick, *B.* More specifically, a Dutch or Flemish Brick.

Compass Brick. Same as Arch Brick, *A.*

Dutch Brick. A hard, light-coloured brick originally made in Holland and used in England for pavements; hence a similar brick made in England.

Face Brick. One of a superior quality used for the face of a wall.

Fire Brick. One made of a refractory clay which will resist great heat. Used for the lining of flues, furnaces, and the like.

Flemish Brick. Similar to Dutch Brick.

Floating Brick. A brick so light that it will float on water. This brick is remarkable as a non-conductor of heat, and for its fire-resisting qualities. — (C. D.)

Furring Brick. A hollow brick for furring or lining the inside face of a wall. Usually of the size of an ordinary brick, so as to bond readily, and grooved on the face to afford a key for plastering.

Gauged Brick. Any brick, ground or otherwise, prepared to fit accurately a given curve; specifically, same as Arch Brick, *A.*

Hollow Brick. A brick having one or more perforations forming more or less continuous ducts or channels when laid up. Used extensively for non-combustible floors and partitions, on account of its lightness and fire-resisting qualities.

Pilaster Brick. A brick for constructing pilasters or slightly projecting piers, the end of which is so notched or rebated that it bonds more readily with the backing, and thus increases the stiffening of the wall. — (A. P. S.)

Place Brick. Same as Salmon Brick.

Pressed Brick. One which has been pressed, before drying, in a mould by hydraulic or other means, so as to become very hard, compact, and uniformly shaped.

Red Brick. In Great Britain, a brick of a more or less pronounced red colour used in better classes of construction, so called to distinguish it from the common kinds, which are browner.

Salmon Brick. A soft, imperfectly burned brick; so called from its pale, salmon-like colour.

Stone Brick. A hard brick made in Wales and valuable as a fire brick.

Ventilating Brick. A hollow brick used as an inside lining, or in the body of a wall, so as to form continuous air ducts.

Washed Brick. A brick rendered inferior by exposure to rain before burning.

Water Struck Brick. A brick in which water was used instead of sand to prevent the adhesion of the clay to the mould. This process was in use in New England before 1840; and the bricks made in this way can be recognized by peculiarities of surface. — D. N. B. S.

BRICK (v.). To lay bricks, especially to cover, surround, or enclose by laying bricks. Generally with up or in.

BRICKBAT. (See Bat; Closer.)

BRICK BEAM. A lintel formed by several courses of bricks held together by iron straps built into the horizontal joints and acting as tension members. — (A. P. S.)

BRICK BOND. (See Bond.)

BRICK FENDER. A brick foundation wall to support a hearth at the lowest story of a house. — (A. P. S.)

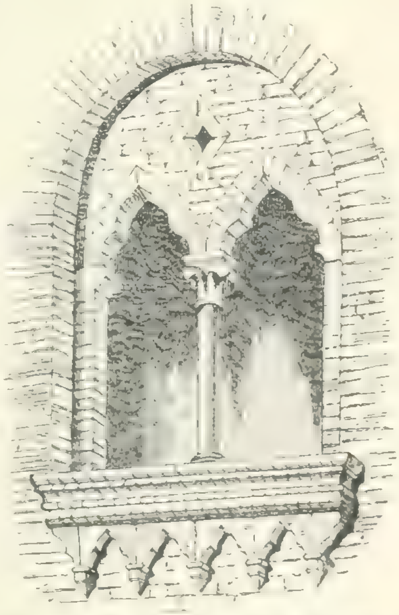
BRICKLAYING. The art and practice of laying bricks in masonry. As the purpose of bricklaying, when simple and confined to ordinary walls, is merely to produce a solid, almost homogeneous mass of small pieces of baked clay held together by strong mortar, the chief training given to a bricklayer is to lay bricks rapidly with fair accuracy and tolerable neatness. Face bricks are laid by men especially trained for that purpose, or who have become especially skilful; the modern face brick being usually attached to the body of the wall in a very imperfect way, requiring considerable knack on the part of the workmen. The more difficult parts of bricklaying are the laying up of flues, where no lining, as of earthenware pipe, is to be used; the building of the throats of chimneys, upon the accurate adjustment of which much depends; and the doing of corbelled-out work with chimney tops and the like, all of which may be considered, together with the laying of moulded brick, as unusual and ornamental parts of the trade. (See Brickwork. For the peculiar styles of laying bricks more commonly in use, see Bond.)

It is generally admitted that bricks should be laid in an abundance of mortar, which should fill the vertical as well as the horizontal joints, and this in the middle of the wall as completely as those which show on the face. Engineers and architects agree in requiring such work as this, and whenever a piece of work, done thoroughly by the government engineers in a fortress, is examined, it will be found that the wall or vault consists of a solid and nearly homogeneous mass. It is a common practice, however, to build brick walls with a much smaller allowance of mortar, thereby saving a great deal of time for the bricklayers; and this practice is defended by some reputable builders, on the ground that a very solid and homogeneous wall has no internal joints where the water, absorbed from external storms, can trickle down and gradually disappear; but that such moisture goes through the wall and affects the inner face. Inasmuch as both in Great Britain and in America, the large majority of brick-walled houses are built with a tacit understanding that they are to last for but a few years, this practice has not proved as objectionable as it seems; and it is extremely difficult to get walls built with the solidity desired by a careful constructor. — R. S.

BRICK NOGGING. The filling of brickwork between the members of a framed wall or partition. (See Nogging.)

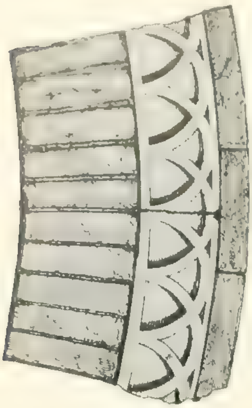
BRICK TRIMMER. Same as Trimmer Arch (which see under Arch).

BRICKWORK. Masonry of bricks and mortar (see Bricklaying). This article deals especially with that which has attractive qualities, as of perfect finish or of patterns in colour, or in relief produced in the structure itself. Roman brickwork, of which so much is said, was almost uniformly a mere sheathing for the strong masonry of broken stone and cement mortar of which even thin walls were composed in and near the city of Rome during the Imperial period. The bricks of which these facings were composed were generally triangular tile, thin in proportion to their other dimensions. The facing was then composed of the longest edge, — the hypothenuse of the triangle, — and these were arranged so as to break joints, the point of the triangle bonding firmly into the masonry within. This brickwork was never decorative in any sense, as it was expected to be covered up either by slabs of marble or fine stone, or by stucco. The facing in enamelled and richly coloured bricks, as in Persia, at different epochs, hardly comes into the present

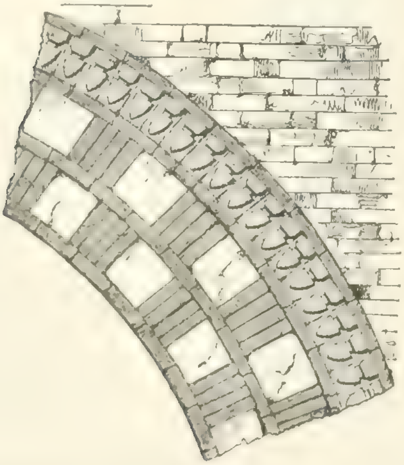


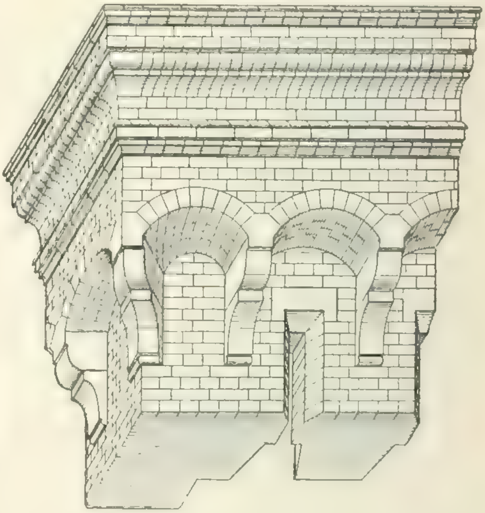
Brickwork Window at Coccaglio, Lombardy, Italy, 14th Century.

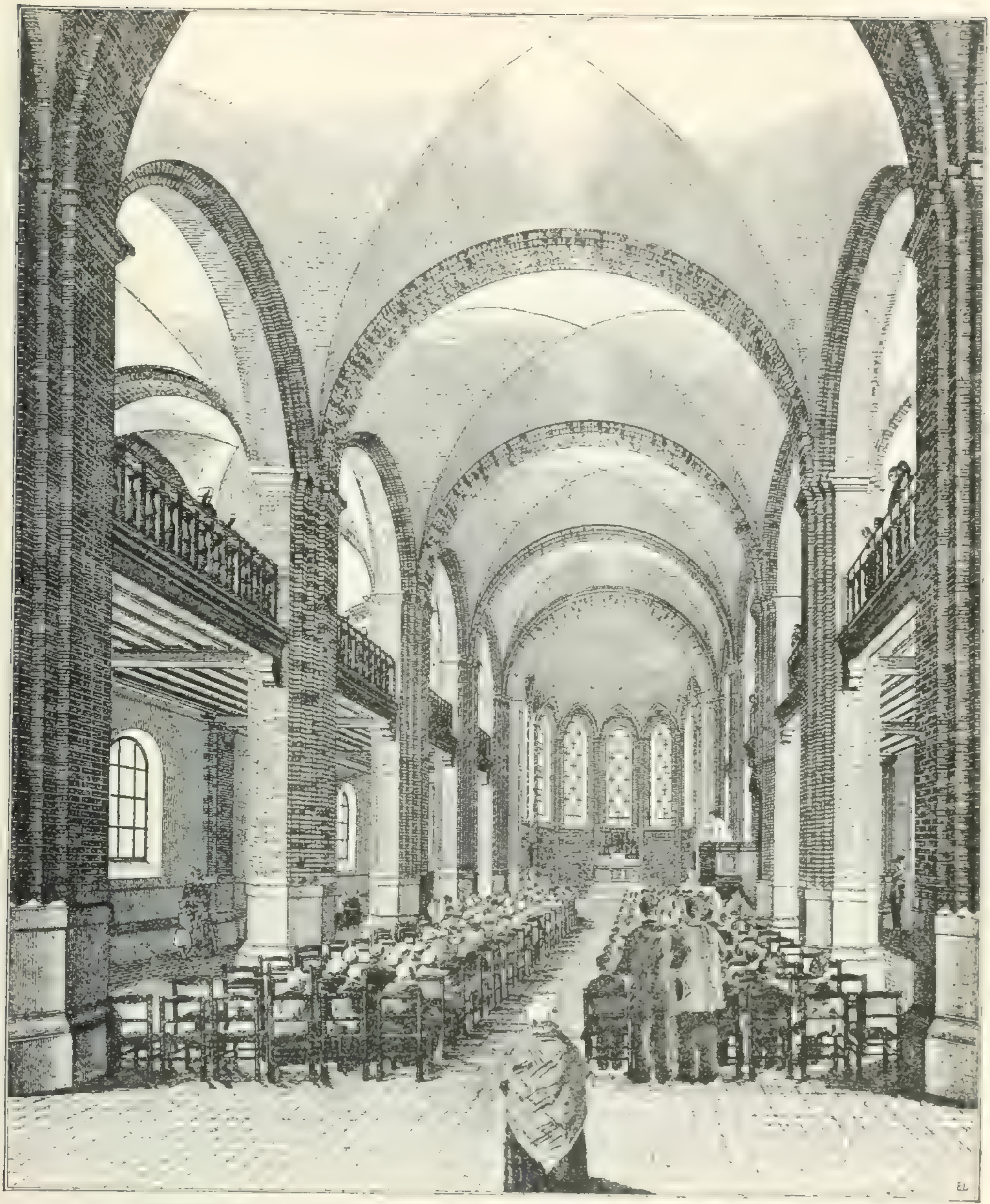
consideration, as it is a highly specialized work in decorative sculpture rather than brickwork. Sun-dried or unbaked bricks are hardly ever the subject of fine workmanship, as they are known to perish rapidly if left exposed, and are, therefore, never treated ornamentally.


Brickwork: Archivolt at Cremona.

The most interesting brickwork, in an artistic sense, is that of mediaeval times. The poverty of the people and their princes, and the great difficulty of land transportation, made it natural to build with brick in any country where stone of good quality was not common. Thus, in northern Italy marble could be brought in moderate quantities from the Tuscan mountains or from the western Alps; or in Venice, Istrian stone could be brought by sea across the Adriatic; but still it became natural to use brick for the greater part of the work. The unsettled state of the country and the thinness of the population which in most parts of Northern Europe caused the Gothic builders to use cut stone, caused the builders of Lombardy, and those of the great German plain south of the Baltic, to use brick. The Roman organization was gone, and work had to be done with a few craftsmen and still fewer skilled masons; therefore the materials had to be such as could be utilized in this way. (Compare Masonry.) When, however, brick was forced upon the builders as the only material which they could use with economy, it would become obvious to the master masons that this material possessed artistic possibilities, and the facility of making it in any simple form, and the resources of colour decoration which the different glaze and the different ways of firing afforded, would become evident. We have, then, from the tenth century the use of brick both moulded and used in contrasting colour, in such buildings as the tower of S. Gotardo in Milan; the cathedral at Cremona; the Palazzo Agostini at Pisa; S. Francesco at Brescia; S. Pietro Martire at Verona, all of the Gothic period, and hundreds of buildings of equal interest of this and of later times. In these buildings, moulded brick and the contrasted colours of brick are the chief decorative features. In like manner, in Germany, buildings of Lübeck, Brandenburg, Tangermünde, Stendal, Königsberg, and many other towns are constructed and decorated by brickwork almost unaided, as generally thought, by other more solid material. This is peculiarly noticeable after the introduction of Gothic architecture, for a serious attempt was made to build Gothic churches entirely of baked clay, the constructional and decorative parts alike. (See Germany (the northeast) and Gothic Architecture.) Nothing of the kind had existed in antiquity, for, if burned or unburned bricks had formed the mass of the structures on the banks of the Euphrates, it does not appear that the architectural treatment depended upon the colour or the form of the separate pieces of clay. These were merely massed together in vast agglomerations to receive and to carry the decorative appliances which were to delight the eyes of the inmates,


Brickwork: Archivolt in the Bishop's Palace, Manila.


Brickwork: Modern Wall-cornice, with Arches resting on Terra-cotta Corbels.



Brickwork: Modern Church, Nœux-les-Mines, near Calais, France.

while the exterior was impressive chiefly from its overwhelming mass. (See Keramics; Terra Cotta.)

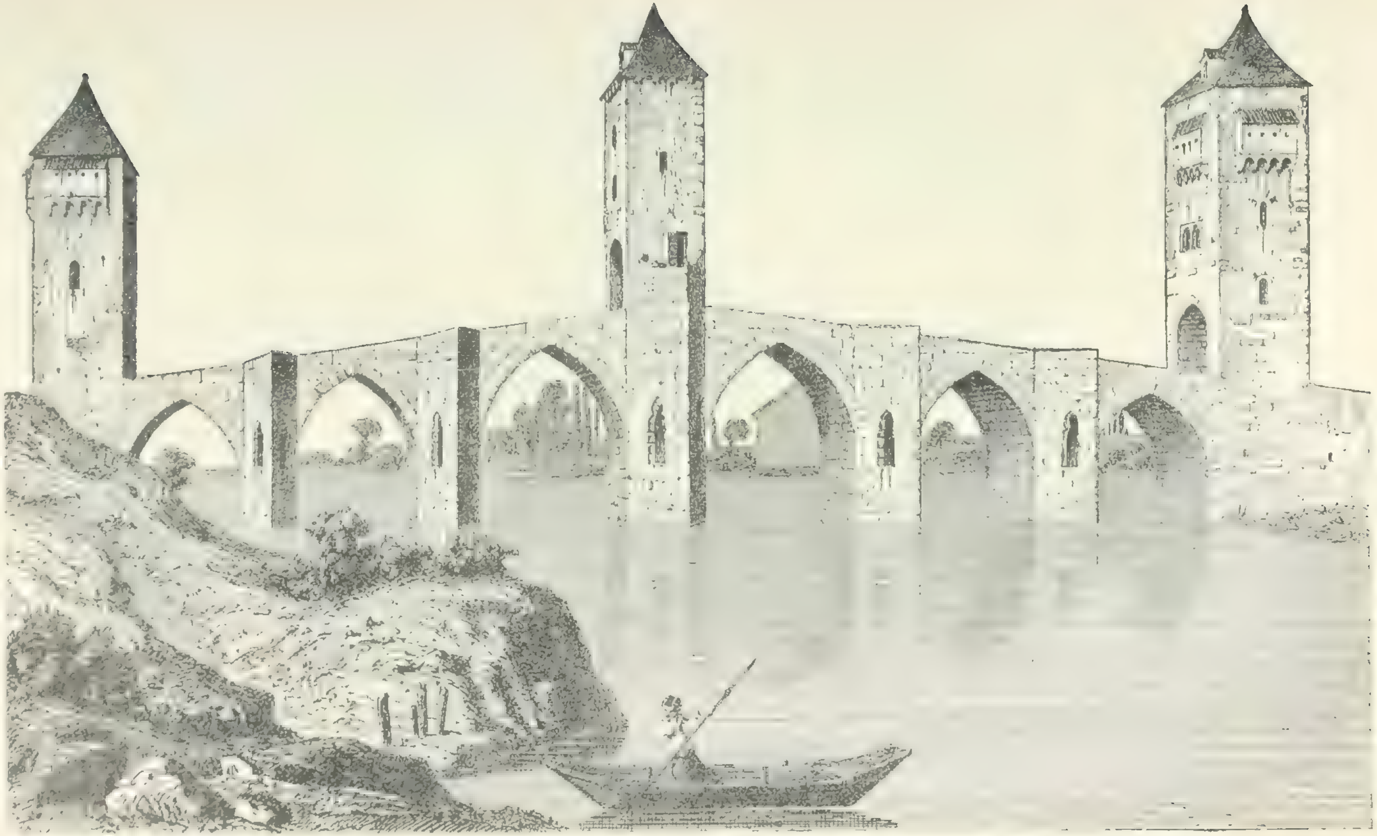
Strack, *Ziegelbauwerke des Mittelalters und der Renaissance in Italien*, is admirable for the decorative brickwork of Italy; and for Germany, the best books are Adler, *Backsteinbauwerke des Preussischen Staats*; and Haupt, *Backsteinbauten der Renaissance in Norddeutschland*. These are folios and somewhat expensive; but it is hard to imagine a proper treatment of the subject without large plates. Street's *Brick and Marble in the Middle Ages* is devoted to North Italy and is full of interest. Gruner, *Terra-Cotta Architecture of North Italy*; and see the bibliographies under Keramics and Terra Cotta. — R. S.

BRIDGE. A structure by means of which a path, roadway, or the like is carried over a trench, a ravine, watercourse, or other depression. This may be a mere slab of stone, or a plank, or rough log supported at either end, or a structure of masonry as elaborate as that of Bordeaux, or Waterloo Bridge in London; or as rich architecturally as the Ponte SS. Trinita at Florence, or as the Pont de l'Alma, or the Pont d'Iena at Paris; or, finally, a suspension bridge like that between New York and Brooklyn, which is much the largest existing; or, in the way of railroad bridges, the immense

Bridge (Roman) at Alcántara, Spain.

Tay Bridge in Scotland. In the history of architecture, these bridges are the most attractive which are something more than mere passages for carriages and pedestrians. Thus, the mediæval bridges of European cities, when covered with the houses which once stood upon them, were of a value which they have since lost; and a bridge like that of the Rialto at Venice, with rows of shops along it, and an archway at the crown, or one like that of S. Chamas in the south of France, with a memorial arch at either end, express the instinctive desire of man to make of a bridge something more than a viaduct. On the other hand, a viaduct bridge in the usual sense, or an aqueduct bridge, will be interesting in proportion as its construction is elaborate and varied; thus the Pont du Gard in southern France, or the bridge at Auteuil in Paris are interesting because of the superposition of two or three arcades of differing scale and proportion. High Bridge in New York is an aqueduct bridge with a passageway for pedestrians above, and that is interesting because of its great height and generally good proportion; on the other hand, the Washington Bridge, about a mile distant, is a recent construction in which two great steel arches, each of more than 500 feet span, spring from stone piers and imposts, the whole forming one of the nearest approaches to the great desideratum — the making beautiful works of pure engineering science. The city of Venice owes part of its attraction to its numerous bridges, of which, by far, the largest is the bridge of the Rialto, above named. The smaller ones are seldom more than 30 feet in span in a single arch, and they are ascended on either side by steps. None of very early times remains, but those of the seventeenth century are numerous and interesting. A most picturesque structure is the bridge at Verona, which crosses the Adige from the city proper to the old fortifications on the hill to the north. This

Bridge uniting Two Palazzi at Foligno, Italy.



BRIDGE OF VALENDRE, WITH FORTIFIED TOWERS, AT CAHORS, SOUTHWESTERN FRANCE.

bridge has its parapet cut into battlements of the forked or so-called Scaliger type, on either side. Many bridges have been built during the last two centuries with deliberate decorative effect, as in private or public parks; even having, in certain instances, pavilions, or "summer houses," built upon them. It has often been pointed out that the common bridges of antiquity and of the Middle Ages, which connect two shores of not very great elevation above a ravine or stream, and which rise in a curve dependent upon the height of the arches below,—which height is in its turn dependent upon the width of those arches, which varies according to the facility of finding good foundation for the piers, — that such bridges are often far more beautiful structures than the modern engineer's bridge with a perfectly level roadbed and parapet. On the other hand, where the banks are high, every inducement is offered to span the open space with a single arch, and in many such cases the roadbed will be level, or nearly so. Moreover, the vastly greater convenience of the level roadway for heavy vehicles of all sorts is evident. Even the slight rise of some of the Paris bridges causes a serious strain to the horses which draw omnibuses and loaded wagons. (See Pont, Ponte, and following terms.) — R. S.

Bascule Bridge. A form of drawbridge having a platform pivoted near the centre, one end dipping into a pit as the other end rises by the operation of a bascule; or, perhaps, having a pair of levers in place of one half of the platform, each having its own pit or channel at the side of the roadway.

Drawbridge. Any bridge of which a part or the whole can be temporarily moved from its piers or abutments, either to allow the passage of vessels, etc., or prevent ingress and egress over itself. In the Middle Ages a drawbridge giving access to a castle or fort across a moat was so hung or pivoted as to block the entrance when the outer end was raised by chains or otherwise. This was accomplished sometimes by the aid of balance-beams pulled down on the inside of the gate, the outer ends as they rose fitting into chases cut in the outer wall; sometimes by a strong pull, as of a windlass, moving the inner end either upward or downward. Other forms, both ancient and modern, involve the movement of the bridge in its own plane, either around a pivot (swing bridge), or in and out, on rollers.

Suspension Bridge. A roadway hung by a series of suspension rods from cables passing over two lofty and massive towers, and firmly anchored at the extremities.

Swing Bridge. A bridge which, in whole or in part, may be swung aside to give passage for river craft or canal boats.

Tower Bridge. In London, erected during the last decade of the nineteenth century. Although picturesque in appearance, it is rather a subject of study as a piece of engineering than of importance in a strictly architectural sense. So called as being just below the Tower of London.

Waterloo Bridge. In London, and spanning the Thames, immediately above Somerset House, built by John Rennie between 1812 and 1817. It has nine arches, each of about 120 feet span.

Westminster Bridge. In London, spanning the Thames, built about 1860 from the designs of Thomas Page. It is immediately below the new Westminster Palace, and has seven arched trusses of iron bearing upon granite supports.

BRIDGE BOARD. Same as String Board.

BRIDGE OF PRAGUE. (See Karlsbrücke.)

BRIDGE OF SIGHS. (In Italian, Ponte dei Sospire.) In Venice, the bridge which spans the narrow Rio del Palazzo and connects the Ducal Palace with the prisons. It is far above the water, at the third or fourth floor of the buildings it connects, and is a covered and enclosed bridge forming a chamber which is divided lengthwise by a partition, so that persons going and those coming will not meet. It is of a late style, constructed about the close of the sixteenth century.

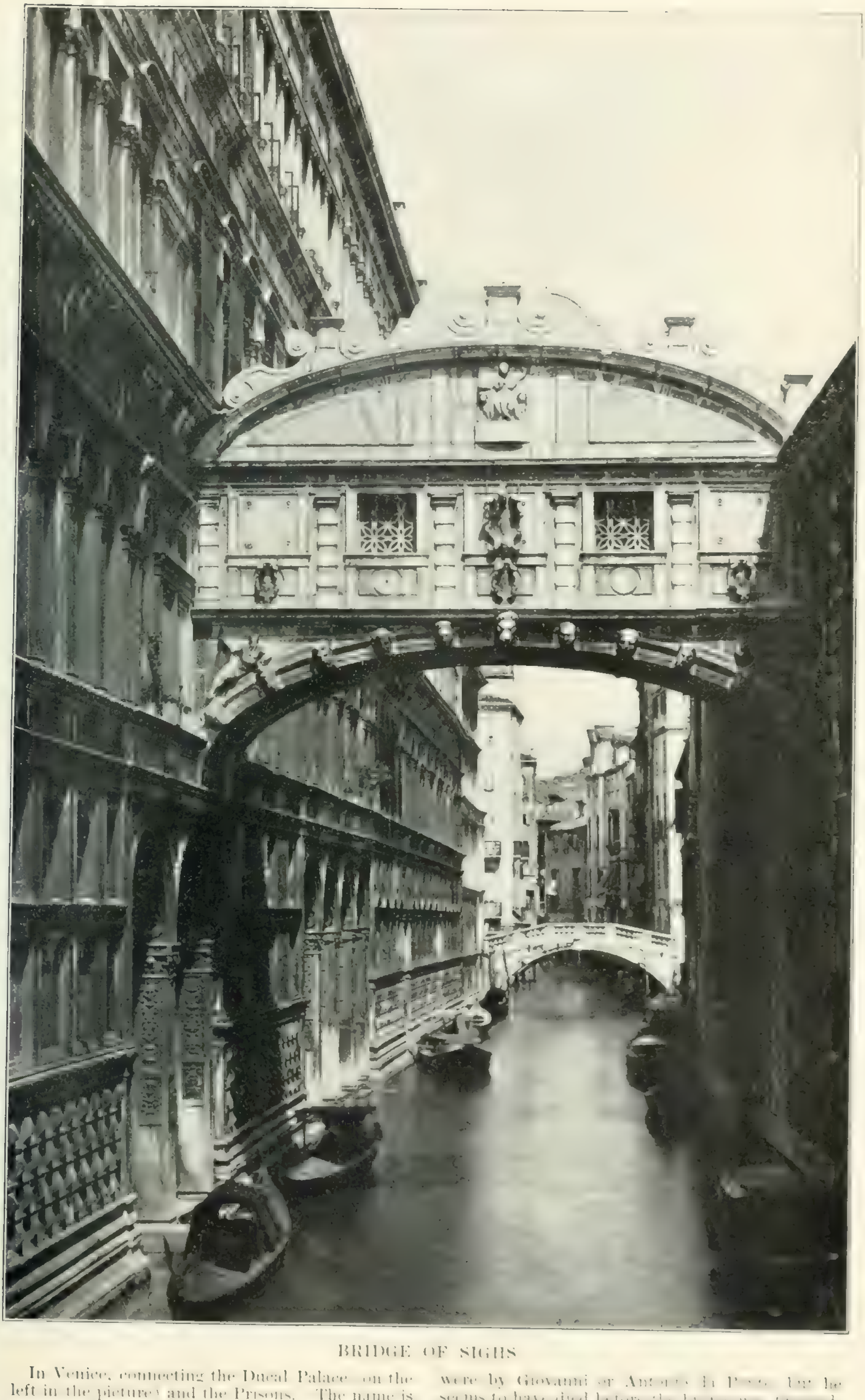
BRIDGE TOWER. A tower erected upon a bridge, commonly at one end, to serve as a defence, gate, memorial, or otherwise. A celebrated example is the fine Gothic tower at one end of the bridge (Karlsbrücke) at Prague.

BRIDGING. *A.* A piece, or pieces, of scantling, or heavier timber, placed transversely between other timbers to stiffen them and to distribute the weight of a load more evenly on them.

B. The setting of bridging pieces, or of any pieces which are to serve as struts or stiffeners between parallel beams. When the bridging between the floor joists forms a series of x's, it is often called Cross Bracing and Cross Bridging, in the United States.

Cross Bridging. A kind of bridging consisting of a series of small diagonal braces set in rows transversely to the timbers. The braces are generally of light scantling, about 2 inches by 3 inches, or somewhat less, and, in floors, extend from the top of one beam to the bottom of the next, crossing each other at the middle. The term, as also herringbone bridging, is usual in the United States; drumming, dwanging, strutting, and herringbone strutting being applied in different parts of Great Britain. The continuous rows of such crossing braces are generally put in about five or six feet apart. (See Cross Bracing, *B*, under Bracing.)

BRIDGING FLOOR; JOIST, etc. (See Floor; Joist; etc.)



BRIDGE OF SIGHS

In Venice, connecting the Ducal Palace (on the left in the picture) and the Prisons. The name is a translation of the Venetian *Ponte dei Sospiri*. The Prisons are of 1590, and the bridge was built immediately afterwards. The designs for both were by Giovanni or Antonio da Ponte, but he seems to have died before the bridge was finished, the work being completed by Antonio Contino. A work of the Decadence, the bridge is still full of grace and light solidity.

BRIDLE. In parts of Great Britain, same as Trimmer. Also written Bridling.

BRIDLE IRON. In local, United States, usage, the same as Stirrup.

BRINGING FORWARD. The operation of so priming or painting old work and new, when juxtaposed, that the whole shall be uniform in color and finish.

BRIOSCHI, BENEDETTO DE; sculptor and architect.

Brioschi assisted Giovanni Antonio Omodeo (see Omodeo) in the execution of the façade of the Certosa of Pavia, Italy. The portal (after 1501) is especially credited to him. After 1483 he appears in the records of the construction of the cathedral of Milan.

Müntz, *Renaissance*.

BRIOSCO, ANDREA (called Riccio); sculptor and architect of Padua; b. April 1, 1470; d. July 8, 1532.

The son of one Ambrogio Briosco, a Milanese goldsmith in Padua. He was a pupil of the sculptor Bartolomeo Bellano (see Bellano). In 1500 he designed the Capella del Santo in the church of S. Antonio, Padua. About 1505–1507 he made two bas-reliefs for the choir of S. Antonio. The contract, dated June 19, 1507, for his great candelabrum at S. Antonio is given by Gonzati (op. cit., Vol. I., Doc. 84). This work was finished in 1516, and is 3.92 metres high and 1.12 metres in extreme width. For the church of S. Fermo in Verona he made the tombs of Girolamo and Antonio della Torre. Eight bas-reliefs from Girolamo's tomb are now in the Louvre (Paris). Nov. 12, 1516, Briosco was commissioned to make the model for, and direct the works at, the church of S. Giustina at Padua. (See Leopardi.)

C. C. Perkins, *Italian Sculptors*; Müntz, *Renaissance*; Paoletti, *Rinascimento in Venezia*; Baldoria, *La Chiesa di Santa Giustina a Padova*; Gonzati, *Basilica di San Antonio*.

BRISVILLE, HUGUES; iron-worker (*serrurier*).

Brisville was *maître serrurier* to Louis XIV. (b. 1638; d. 1715). He was associated with Jean Bérain (see Bérain) in the decoration of the royal palaces. There is an entry in the accounts of Louis XIV. for work done at the château of Saint-Germain-en-Laye. Brisville published *Diverses pièces de Serrurerie . . . gravées par J. Bérain* (Paris, 1680, folio).

Guiffrey, *Comptes de Louis XIV.*; Valabrègue, "Jean Bérain" in *Revue des Arts décoratifs*.

BRITTON, JOHN; antiquary: b. 1771; d. Jan. 1, 1857.

John Britton was the son of a village storekeeper. At the age of sixteen he was apprenticed to his uncle, a tavernkeeper, in London. In 1799 he published his first book, *The Adventures of Pizarro.* He next undertook, with the assistance of E. W. Brayley (see Brayley), the *Beauties of Wiltshire* (1801–1825). The *Beauties of England and Wales* appeared about the same time. Britton and Brayley withdrew from this work in 1814. He published independently the *Architectural Antiquities of Great Britain* (4 vols., 4to, 1807–1814). A fifth volume, containing *A Chronological History and Illustration of Christian Architecture*, was published in 1826. After this came *Cathedral Antiquities of England* (14 vols., 4to, 1814–1835). With the co-operation of A. C. Pugin (see Pugin), he produced *Specimens of Gothic Architecture* (1823–1825), *Architectural Antiquities of Normandy* (1 vol., 4to, 1828), and *Illustrations of the Public Buildings of London* (2 vols., 4to, 1825–1828). He published independently a *Dictionary of the Architecture and Archæology of the Middle Ages* (1 vol., 4to, 1838), and, with Brayley, a *History and Description of the Ancient Palace and Houses of Parliament at Westminster* (1834–1836). The *Autobiography* of John Britton appeared in 1850 (see Bibliography).

Britton, *Autobiography*; Britton, *A Brief Memorial of His Life and Writings.*

BROACH (n.). A straight, slender, and pointed object, especially:

A. In ancient English usage, any spire. In local modern English usage, a spire which springs directly from the tower beneath, without any parapet or similar feature at the base.

B. In a lock, the pin over which the barrel of a key fits.

C. A pointed tool for roughly dressing stone. (See Stone Dressing.)

BROACH (v.). To dress stone with a broach, generally the second process in stonecutting following the scappling or hammer dressing. (See Stone Dressing.)

BROAD STONE. *A.* Same as ashlar.

B. Formerly in English usage paving stones which came from the quarry in broad, thin pieces. — (A. P. S.)

BROB. A wedge-shaped spike used to secure the end of a timber which butts against the side of another, as a post standing on a sill. In driving, its sloping sides force it close against the side of the member to be secured.

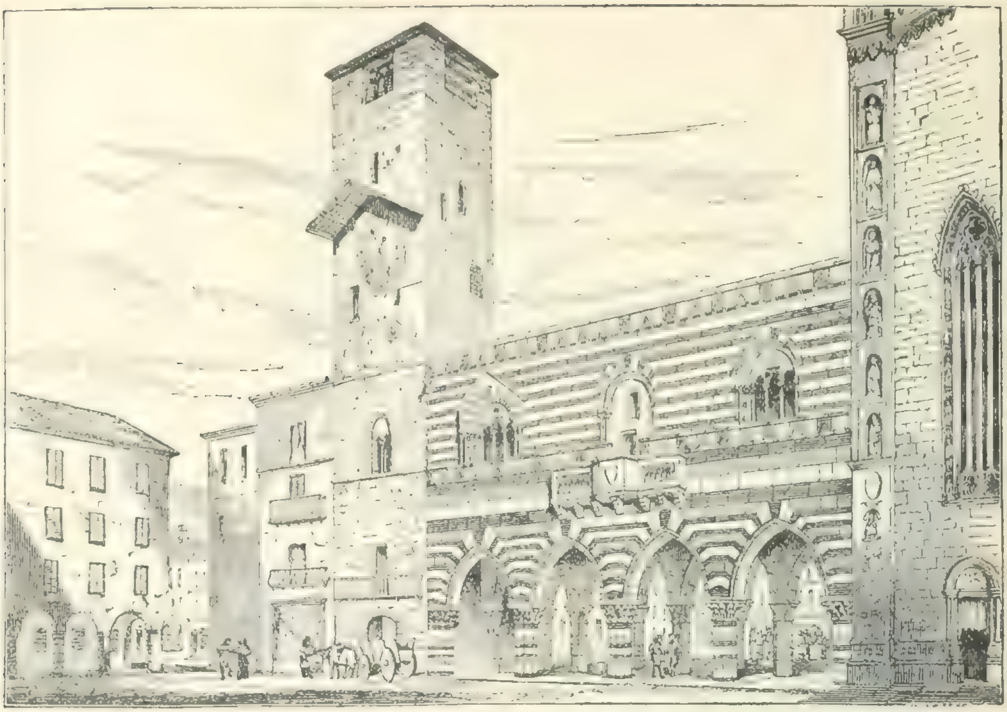
BROEBES (or **PROVES**), **JEAN BAPTISTE**: architect; d. 1733.

In 1686 Broebes built the *Alte Boerse* in Bremen (Germany).

Gurlitt, *Geschichte des Barockstiles in Deutschland.*

BROEUCQ. (See Dubroeucq.)

BROLETTO. In Italian art, a town hall or municipal building of any kind. The term is used chiefly in connection with the cities of Lombardy, and the broletto of Como and that of Bergamo are specially celebrated. As the broletto frequently adjoins the cathedral, it is



Broletto at Como, Lombardy.

very near to it, an architectural mass of great interest sometimes results. (Cut, cols. 373, 374.)

BRONGNIART, ALEXANDRE THEODORE; architect; b. Feb. 15, 1739; d. June 6, 1813.

Brongniart was a pupil of Jacques François Blondel (see Blondel, J. F.). He was associated with Jacques Ange Gabriel (see Gabriel, J. A.), and succeeded him as architect of the *École Militaire*. Brongniart's chief work is the Bourse (Exchange), in Paris, which he designed. The first stone was laid March 24, 1808. He completed only the basement.

Lance, *Dictionnaire*; Charles Lucas, in *La Grande Encyclopédie*; Ministère de l'Instruction Publique, *Inventaire Général, Monuments Civils*, Vol. II., p. 53.

BRONZE. (See Metal Work.)

BRONZE (v. t.). To give to metal and even to wood or other solid material a specially selected metallic appearance, as of bronze, gold, silver, or the like, by investing its surface with a metal powder (see Bronze Powder), or a liquid, or a paint containing large amounts of metallic powder more or less fine, which being left upon the surface may produce an almost deceptive resemblance to the solid metal. Much the most common use of bronzing is in the imitation of gold or some alloy of gold, and this is improperly called gilding. Gold-bronze powders are made in imitation of red gold, yellow or pure gold, greenish gold, etc., and these are sometimes used together to produce a chromatic effect. — R. S.

BRONZE POWDER. Metallic powder used in decorative painting and the like, and by which are produced what is commonly but wrongly called "gilding" in many different tints of gold, and also "silvering," "bronzing," etc. (See Bronze.)

BROOM (v. i.). To spread out in broom shape through separation of the fibres, as when a pile is partly crushed at its head under the blows of the pile driver.

BROSSE, JACQUES DE (see Brosse, Salomon de).

BROSSE, JEAN (JEHAN) DE; architect; d. 1585.

Jean de Brosse is mentioned in the accounts of Marguerite de Valois, first wife of Henri IV. (b. 1553; d. 1610), as *architecte et secrétaire d' icelle dame*. He married Julienne, the sister of Jacques (I.) Androuet du Cerceau (see Androuet, J., (I.)), and was the father of the famous Salomon de Brosse (see Brosse, S. de).

Jal, *Dictionnaire*; Bauchal, *Dictionnaire*.

BROSSE, PAUL DE; architect.

Paul is supposed to have been a son of Salomon de Brosse (see Brosse, S. de). He was appointed architect to Louis XIII.

Jal, *Dictionnaire*; Bauchal, *Dictionnaire*.

BROSSE, SALOMON (JACQUES) DE; architect; b. about 1560 (at Verneuil-sur-Oise, France); d. Dec. 7, 1626.

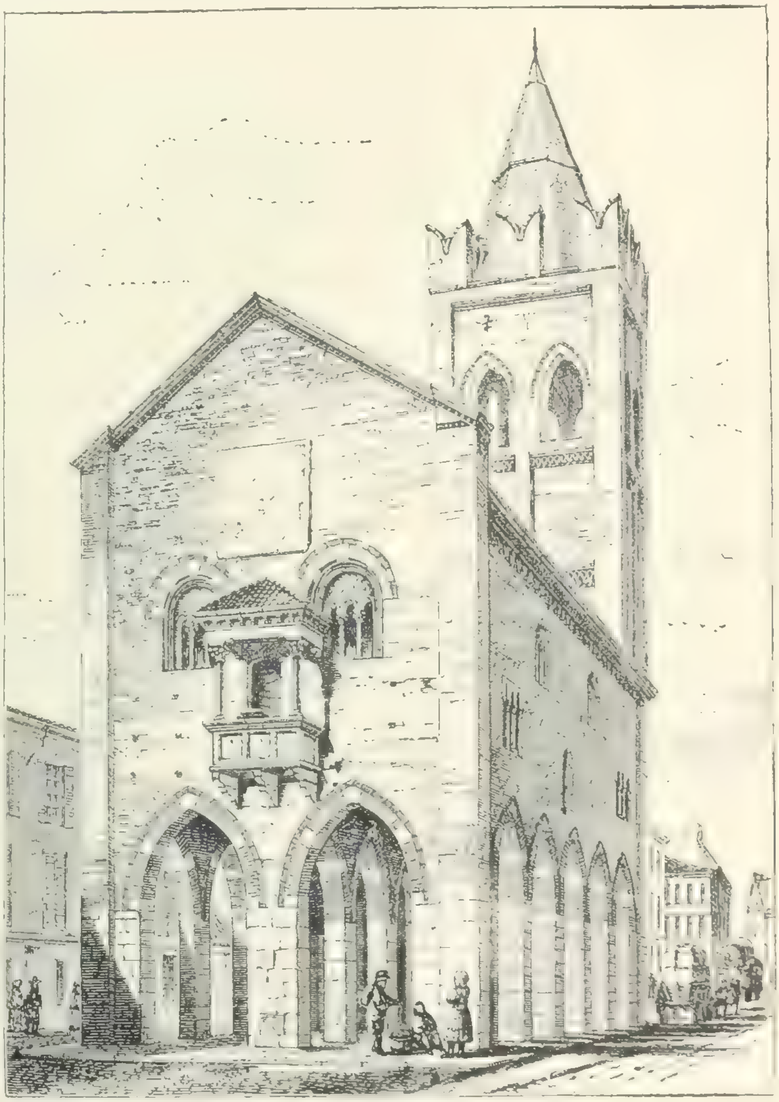
The baptismal name of the great De Brosse was Salomon, and not Jacques as formerly supposed. He was probably a son of Jehan de Brosse (see Brosse, Jean de) and a nephew of Jacques (II.) Androuet du Cerceau (see Androuet du Cerceau, Jacques, (II.). He was appointed architect of Maria de' Medici, queen of Henri IV. (b. 1553; d. 1610). In 1615 he began for her the palace of the Luxembourg (Paris), which was nearly completed in 1620. The principal characteristics of the Luxembourg are usually supposed to have been derived from the garden façade of the Palazzo Pitti in Florence (see Ammanati). They were probably rather suggested by the old château of Verneuil-sur-Oise (destroyed), which is supposed to have been designed by Jacques (I.) Androuet du Cerceau (see Androuet du Cerceau, Jacques, (II.)). Between 1613 and 1624 Salomon built the new aqueduct of Arcueil to supply the Luxembourg with water. He built also the fountain of the Medici in the Luxembourg garden. Between 1616 and 1621 he built the portal of the church of S. Gervais (Paris), and between 1618 and 1620 the *Salle des Pas-Perdus* at the *Palais de Justice* (Paris), to replace the mediæval hall burned in 1618. De Brosse was a Huguenot. In a register of burials of an old Protestant cemetery in Paris is found the entry, *Salomon de Brosse, ingénieur et architecte des bastimens du roy, natif de Verneuil, enterré a Saint-Père, le 9. decembre 1626.*

Charles Read, *Salomon de Brosse*; Maurice du Seigneur in Planat, *Encyclopédie de l'Architecture*; De Gisors, *Le Palais du Luxembourg*; Von Geymuller, *Les du Cerceau.*

BROUGH. In Celtic archæology, a round structure of prehistoric age, or the ruins of such a structure. (Compare Earth House; Pict's House.)

BROWN, A. PAGE; architect; b. Oct. 19, 1859; d. Jan. 21, 1896.

He was educated at Cornell University. After working for three years in the office of McKim, Mead, and White (New York City) he spent two years in Europe. On his return he designed the Art Museum and several other buildings for Princeton University. He is best known by the California state building which he designed for the World's Fair in 1893. He designed several important buildings in California.



BROLETTO AT MONZA, LOMBARDY.

American Architect, Vol. LI., p. 57.

BROWNING. Same as Brown Coat (which see under Plaster).

BROWNSTONE. A sandstone of prevailing [illegible]. Ex., the Connecticut, New Jersey, and Pennsylvania brownstones.

G. P. M.

BROW PIECE. A beam over a door; a sort of summer. (N. E. D.)

BROW POST. A cross beam. (N. E. D.; A. P. S.)

BRUANT (BRUAND), LIBERAL; architect; b. about 1635; d. Nov. 22, 1697.

A son of Sebastien Bruant (d. 1670), who was *maître général de charpenterie du roi* about 1635. Bruant made the original designs for the hôtel and church of the Invalides, begun Nov. 30, 1671. He built the choir and nave of the church between 1671 and 1679. The work was completed by Jules Hardouin-Mansart. (See Hardouin-Mansart, Jules.)

Guiffrey, *Comptes de Louis XIV.*; Bauchal, *Dictionnaire*; Lance, *Dictionnaire*.

BRUANT, SEBASTIEN. (See Bruant, Liberal.)

BRUCE, SIR WILLIAM; architect; d. 1710.

Sir William Bruce, Scottish architect, was the second son of the third baron of Blairhall. By letter of Charles II., dated June 3, 1671, he was appointed "general overseer and superintendent" of the reconstruction of the palace of Holyrood (Edinburgh, Scotland).

Mylne, *The King's Master Masons*; Redgrave, *Dictionary of Artists*.

BRUNELLESCO; BRUNELLESCHI (FILIPPO DI SER BRUNELLESCO); architect; b. 1377; d. 1446.

Filippo's father received the name Brunellesco from his own mother's family, the Brunelleschi, of Florence. Filippo was born in Florence, and apprenticed to a goldsmith. He was early interested in mechanics, and made many practical inventions. Two statuettes of prophets, in the silver retable of S. Giacomo at Pistoia, are supposed to be by him. He made, also, a wooden crucifix, at S. Maria Novella. He entered the competition for the doors of the Florentine Baptistery, in 1401 (see Ghiberti). From 1401 to 1417 Brunellesco appears to have lived in Rome, with Donatello (see Donatello), making occasional visits to Florence. In 1404 he joined the corporation of jewellers, and, in the same year, served on a commission at the cathedral of Florence. In 1415 he again appears at the cathedral. The general scheme of the dome was, undoubtedly, established by the model made about 1367 (Fabriczy, op. cit., p. 60). (See Giovanni di Lapo Ghini.) In 1417 the work had proceeded as far as the oculi in the eight sides of the drum. The cupola itself was begun in 1425. Ghiberti and Brunellesco, both members of the guild of goldsmiths, of Florence, were associated at first on equal terms. Filippo superseded Ghiberti, and became *capo maestro* about 1438, and *provisore a vita* in 1445. The lantern was finished in 1461 (after his death), from Brunellesco's model. All Brunellesco's work is in Florence or vicinity. The reconstruction of S. Lorenzo was begun not later than 1420. Filippo finished the old sacristy and transept of that church before he died. The nave was built from his plans, after his death, by Manetti Ciacheri (see Manetti, Antonio). He built the Badia, at Fiesole, near Florence, after 1439. The second cloister of S. Croce was built from his designs. The church of S. Spirito was begun by Brunellesco, and finished after his death. The chapel of the Pazzi, at S. Croce, Filippo's most perfect building, was begun not earlier than 1429. The unfinished church of the Camaldoli, or degli Angeli, was begun after 1426. The plan is an interesting example of eight sides on the inside, changing to sixteen on the outside. The *Spedale degli Innocenti* was commenced in 1419. The Loggia, with sculpture by Andrea della Robbia (see Robbia, Andrea della), is well known. He began the Pitti palace, for Luca Pitti, about 1444. Many drawings of this building, after the end of the fifteenth century, show the three stories of the façade, with only seven windows in the second and third. The rest has been added since. The Pazzi palace is attributed to Filippo without documentary evidence. He built a large part of the *Palazzo della parte Guelfa*. Brunellesco is credited with having discovered the modern science of perspective.

Fabriczy, *Filippo Brunelleschi*; Von Geymuller, *Filippo di Ser Brunellesco*; Antonio Manetti, *Vita di Filippo di Ser Brunellesco*; Vasari, Milanesi ed.; Vasari, Blashfield-Hopkins ed.; Nardini-Despotti-Mospignotti, *Filippo di Ser Brunellesco e la Cupola del Duomo*; Guasti, *La Cupola Santa Maria del Fiore*; Guasti, *Santa Maria del Fiore*; Durm, *Die Kuppel in Florenz*; Paolo Fontana, *Il Brunellesco e l'architettura classica*; Mazzanti, *Del Badia, Migliori fabbriche di Firenze*.

BRUNNEN, ANDREAS. (See Pozzo, Andrea.)

BRUNNENHAUS. In Germany, a building erected over a natural spring; especially one resorted to as curative. Such a building, considered as a place of resort, is often treated in a decorative fashion.

BRYAXIS; sculptor.

Bryaxis probably originally came from Caria (Asia Minor), and was educated in Athens. His signature is found on a bas-relief on the base of a monument at Athens. About 350 B.C. he was associated with Scopas (see Scopas), Timotheos (see Timotheos), and Leochares (see Leochares) in the decoration of the Mausoleum at Halicarnassus in Caria.

Collignon, *Histoire de la sculpture Grecque*; E. A. Gardner, *Handbook of Greek Sculpture*.

BUCKINGHAM PALACE. The town residence of the sovereigns of Great Britain: begun by George IV. and finished under William IV., but never occupied continuously by the royal family. It stands in London at the western end of S. James's Park, and south of Green Park. It has no important architectural character.

BUCKLE (v.). To bulge or curve under excessive strain; to deviate from the normal. Used of walls and other members which suffer deflection as under extreme load; of metal plates; of boards, and the like, which warp or twist because too thin or light.

BUCKLED. Past participle of buckle. In a special sense, corrugated; said of thin metal plates. The term was originally applied to corrugations of a peculiar form, connected with a patent.

BUCKLED PLATE. A metal plate, generally square, stamped or wrought with a slight domical convexity, leaving a flat rim with straight edges. Laid on iron beams, they are commonly used on account of their stiffness, as a foundation for fireproof floors.

BUCRANE; BUCRANIUM. An ox skull, used as a symbolic decoration in Roman architecture, in which it had a sacrificial significance, and was confined to altars and temples. It appears to have originated in the primitive practice of affixing the skulls of the oxen sacrificed to the frieze, or other parts, of the temple of the god worshipped. As a decoration, it was associated with garlands, festoons, and fillets. In Renaissance decoration in Italy it occurs as an arbitrary ornament destitute of particular significance. Its inappropriateness, however, prevented its general adoption. — A. D. F. H.

BUDDHIST ARCHITECTURE. That of India of the time of the great Buddhist religious movement, and which is generally assumed to be of the sixth century B.C., and the centuries immediately following. The buildings are mainly in the northern part of the peninsula, from Kashmir in the far northwest to the Ganges, and in Ceylon; but on the western coast of the peninsula they extend as far south as Bombay. Temples and topes of extraordinary magnificence exist at Buddha Gaya, Patna, Amravati, and Benares. At Sanchi, Sarnath, and Bharhut (though of the last named the central mass has disappeared) are topes with gateways and railings (see Railings), which are not buildings in the modern sense, but religious monuments extremely rich in sculpture. (Compare Chaitya Cave; Vimana; and see India, Architecture of).

Fergusson, *Indian and Eastern Architecture*. Gustave Le Bon, *Les Monuments de l'Inde*. Rajendralala Mitra, Buddha Gaya, and the other books named in the bibliography of India, Architecture of. — R. S.

BUFFET. *A.* A sideboard: especially a large, stationary, and somewhat elaborate one with shelves, racks, and the like, for serving refreshments; hence, —

B. In public places, a room where refreshments are served. Generally provided only with counters or bars, and thus distinguished from a restaurant or café, which has tables and chairs; sometimes a place for slight repasts only, luncheons and the like.

In both these senses the word has partly lost the original French signification.

BUFFET BAR. A bar in the sense of Bar, *B*, situated against the wall and forming a more or less extensive buffet. Barrooms and café's fitted in this way, and without bars in the proper sense, are becoming common in the United States.

BUHL AND COUNTER. Decorative work done with the inlay of thin materials (see Boule Work) but having the scroll pattern or similar ornamental device given in the two aspects, first of a piece sawed out and set upon, or within, a different ground; and second, of a larger piece, from which the smaller has been sawed out, with the opening filled in. Thus, if a piece of sheet brass has had a figure cut out of it, the piece so cut away will be mounted, enclosed in perhaps a sheet of tortoise shell; and the piece cut out of the tortoise shell to admit the piece of brass will be inserted in the opening left in the original sheet of brass, so as to produce what in heraldry is called a countering, or counter charging. — R. S.

BUHL WORK. (See Boule Work.)

BUILD (v.). To construct or erect a structure by any process of uniting materials or members. (See Building.)

BUILDER. One who builds, and, in the limited technical sense, one who organizes and manages the various trades for the construction of edifices for the purposes of habitation, religion, industry, and art.

The builder as he exists to-day is a creation of the last four centuries. The Renaissance of classic art in building and decoration, which placed the prerogative of design and the determination of art standards in the hands of students of antiquity, separated these functions from those of construction, and determined new lines to divide the builder from the architect. Previously this division had not existed, or when perchance one did exist it was of a different character.

The builder in antiquity enjoyed a position and prestige which his modern successor has lost. Then the builder was indeed both builder and architect. The architect who was not also the builder was only the author of the general idea and its main features. He might be a king or an ecclesiastic. His share of the work of design might be so little as to determine the number of columns of a portico or the general disposition and dimensions of a cruciform plan; but it was the builder who defined the proportions, the order, the style and extent of decoration, and who drew all the diagrams, and decided by his experience the questions of engineering. He was better enabled to do this by reason of the slow changing traditions which governed the art. He did not, as the modern architect does, direct arbitrarily the design and details. Each workman in his own sphere made his details in the only way he knew. There was no question of purity of style, for the prevailing style was the only one of which the workman had any conception.

Written records are strangely lacking in regard to the individual authorship of ancient architecture. Compared with the age of such relics as the Assyrian and early Egyptian ruins, the buildings of Rome and mediæval Europe are almost recent, and had they been the creation of individual genius the names of their authors would have been blazoned upon the history of mankind. But such names, as of individual artists, rarely appear, and the inference is that the builder and architect, as we know them, were not yet evolved from the heterogeneous art life which was collective and traditional rather than individual and inventive.

This view is supported by the remarkable similarity, not only in great features, but in the minutest details, of all buildings of each period, however far apart in location. This characterized alike the Grecian, the Roman, and the mediæval epochs, and is absolutely lacking in the modern. It reveals positively the existence of direction which was a unifying medium for the art impulses of the times very different from the individual force of the modern builder or architect. This medium was no doubt the guild or society of builders. Fragmentary testimony of record unites with the incontestable evidence of the buildings themselves to show that from the Grecian age down to the Renaissance the art of building was possessed by strong and closely organized fraternities which have now entirely ceased to exist.

The Dionysiacs of Ionia, a company of masons and builders, almost monopolized the building of temples. They had secrets of both scientific and doctrinal character, guarded by signs and passwords and initiations much like those preserved in the ceremonies of Freemasonry. It appears that the strength of these societies was based upon really exclusive scientific knowledge and skill in building, and their mysteries were not sentimental only, but were founded in practical business jealousy of their monopolies.

In Roman times these Greek societies still flourished, and although the personal force of the great military citizens doubtless asserted itself and dominated the builders' operations, the latter still included all art details and engineering responsibility.

Later, when from the ruins of Roman civilization sprang the mediæval styles of the Romanesque and Gothic series, similar conditions of organization of the builders' art undoubtedly prevailed. We again find an age, possessing most limited facilities for recording and communicating, producing works in far removed places showing close similarity, and proving therein a complete unification and organization of their art. Perhaps the guilds of the latter part of this period were in less degree monopolists of the secrets of their work. Industrial education and military science both tended to popularize engineering knowledge; and, as to the artistic, we see, in the latest phases of it, as in the French Flamboyant and its contemporaries, the English Tudor and German late geometrical, differences which are examples of marked independence and which show the disintegration of the old unity of school. And in Italy, where the authority of the mediæval guilds was never great, the individualism which inspired the Renaissance was very early developed. The energetic communities born of commerce and learning afforded good soil for such a growth, and when its strength was developed the other European countries had reached a receptive condition. The mediæval guilds sank into insignificance, and as the individual architect, who was chiefly archæologist, and secondarily engineer, arose to power, the builder sank to the position of a mere chief of mechanics, who pretended to but little art knowledge and whose engineering skill was simply practical and of the "rule of thumb" order. But for some years the traditional habits of building and decorating produced local styles following the models of the strongest designers. This is traceable in England in country work long after the classical methods had taken possession of the capital; and again on the American continent in the early colonial work of the Eastern states (see the terms England; Colonial).

From this position the modern builder has arisen under the stimulus of industrial enterprise. The tendencies toward division of labour, even in the eighteenth century, had produced independence of the several trades, such as mason, carpenter, smith, etc., and to this day much good work is done by builders who each controls only his particular branch of the art; but the necessity for organization, on the other hand, long since demanded a chief directing power which the architect was no longer competent to supply, even if his new professional status had made it desirable. Hence arose the modern builder — namely, a chief executive, who organizes and details the work of the several trades to carry out the projects defined by the architect.

There are two systems in vogue for this purpose. They may be called the English and the American for want of better names, although the latter is the more recent, and is perhaps only American because the rapid growth and change in the United States facilitates reform of such organizations.

In England the builder is usually a contractor of considerable experience, who himself has intimate knowledge of all the building trades, and who employs directly foremen and artificers in each one of them. He is in fact a stone mason and bricklayer, a carpenter and smith, and painter and roofer, by reason of his own technical knowledge, and he maintains, upon his own business premises, yards and shops and depots for all these several purposes.

In America a builder (it must be remembered that operators in large cities are referred to in each case) is usually a contractor who, commanding certain financial resources, assumes a concentrated responsibility, and subdivides it among many subcontractors, each supposed to be technically qualified to produce a certain part of the work required. This builder usually has some experience in a special trade, but his chief qualification is an aptitude for executive organization; and he makes but little effort to understand the needs, artistic or scientific, of his work beyond what is necessary to refer each part to the proper subcontractor.

In comparing these two methods it is sometimes alleged that the latter is inferior; that the lack of expert knowledge and of personal interest on the part of the builder is productive of evil in the executed work, as compared with the older fashion and its results. But it must be admitted that it is the legitimate outcome of our industrial tendencies, and that it has many advantages from the contractor's point of view which make it not only desirable but imperative in the sharp competition of modern business. The larger number of trades now involved, continually increasing as workmen enroll in separate unions for protection of their own interests, make it impossible to unite their operations under a single administration. Then the enormous rapidity of modern building, as well as the size of the edifices, makes two or three (sometimes even one) of such contracts a sufficient undertaking for one builder, and demands a *succession* of the trades rather than a coöperation of them. At one time a hundred ironworkers may be needed, and no other workmen; then later a hundred bricklayers; later stone setters, plasterers, steam fitters, electricians, and so on.

A builder who has ten buildings in course of construction can remove each corps of artisans from one to the other, and so keep all his various trades continuously at work; but one who has a vast amount of work concentrated in one structure to be erected in a short time must find each trade in turn idle. He therefore ceases to employ the workmen of that trade. He sublets each section of the work to a contractor who will bring an army of men when wanted, and, as their labours are lessened, will remove them to perform other subcontracts upon buildings less advanced. In short, the subcontract system permits the effective distribution of labour upon a very large scale, and this alone would enforce its use. But, beyond this, the number of the various trades is becoming very great, and the technical knowledge necessary to control some of them is of a very high order. The subcontracts are further subdivided in many cases, and let a third, or even fourth, time, so that the responsibility is sometimes too far removed from the builder to be readily ascertainable. The building trades, as now usually arranged in the United States, are as follows: —

MASON, including excavator, rock blaster, shorer, pile driver, pneumatic caisson engineer, bricklayer, fireproofing terra cotta setter, stone cutter and setter, scaffolder and hoister, paver, waterproofer and roofer, plasterer, marble and tile workers.

IRONWORKER, including structural work of cast iron, steel in framing of columns, beams, and trusses, ornamental and finishing ironwork, bronze, and other metal works.

CARPENTER, including structural timber framing work, joiner work, cabinet work, copper, tin, and sheet metal work, roofing work (sometimes under Mason), painting, varnishing, glazing.

PLUMBER, including fixtures and machines, piping, marble work, gas piping, tiling.

HEATING AND VENTILATION, including boilers, piping and radiators, engines, pumps, ventilating plant, special fixtures and fittings.

ELEVATOR WORK, including pumps, cars.

ELECTRIC WORK, including wiring, dynamos, engines, bells, telephones, fixtures.

When it is noted that each item mentioned separately is customarily the subject of a distinct subcontract with a special contractor, it will be seen that the ability to specialize each trade is an important impulse toward the system. In fact it becomes apparent that the older or English system can now exist only in part, for it is out of the question that an English builder should maintain a shop for building steam engines or electric machinery, and the most ardent advocate of the system must perforce consent to the subcontracting for such things, or else reserve them to be contracted for separately by the owner. But this latter method leads around the circle to the original need of a chief contractor, and brings us back to the fact that this subcontract system is essentially the method of the modern builder

There is still much work of lesser magnitude done by the various trades without the intervention of any chief contractor; the owner, or his architect, sometimes making contracts for the work under the main headings in the above list; but even then many secondary items are usually subcontracted, the builders being equipped only for the primary work — a mason employing his bricklayers and subletting the stone and plaster; a carpenter employing framers and fitters, and subletting all mill and shop work; and so on.

The repeated reference to contracts and contractors in the lines preceding calls for a brief comment. "Contractor" has become almost synonymous with "builder," because of the settled custom of agreeing beforehand in drawings and written documents upon the extent, character, and cost of building. This development, too, has been much deplored; but again, it is the product of the age.

The old method known as the "days' work" system still prevails to a small extent, but chiefly for work which cannot be determined in advance. In this system all work done and material used are carefully recorded, and their cost, plus an amount or percentage for profit, is charged to the owner. Its advantages include the encouragement of good workmanship by proportionately high compensation. Its defect is the commercial one of removal of responsibility for cost from those who only can control it. The admitted fact that days' work is always expensive is explanatory of its decadence.

It is much to be regretted that this old-fashioned way of making compensation for building work is falling into disuse, especially as the prevalence of other systems brings about an attitude of builders and workmen which robs the days' work method of its chief advantage — namely, loyalty and sympathy for the work itself and the employer. The impulse in "days' work" is to render the best work possible. In "contract" it is to do the least that will be accepted. Another method in use in England is known as the "measured work" system. It is used in America only in engineering or, very exceptionally, in subcontracts in building. In this case a schedule of prices per foot, per yard, etc. is agreed upon, and the work when done is measured up and the total value determined. It is evidently of only limited applicability, and need not be much considered, although it is doubtless true that it combines some of the advantages of a days' work system, with a proper location of responsibility for extravagance and waste.

But the contract system of building is the generally accepted one, and it can only be inferred that it is that best suited to our use. Many of the evils attributed to it, especially the lack of pride in good workmanship, should really be charged to other causes. The custom of awarding contracts upon competitive proposals involving the selection of the lowest bid undoubtedly tends to discourage a high standard; and the uniform wage scale insisted upon by most trades unions, together with their disregard for individual skill, go far to make superlatively good work unattainable, even while they raise the standard of the average.

The builder now as truly represents his epoch as did any of his predecessors, individual or corporate. His work demands of him executive ability and enterprise beyond that shown at any time in the past, and in his army of subcontractors he commands skill and power and inventive genius of such diversity and degree as have been until now unthought of in connection with the builders' art. — ROBERT W. GIBSON.

BUILDERS' HARDWARE. The metallic fittings in common use about a house or other building, such as hinges, bolts, locks. More rarely, by natural extension, larger fittings, but almost entirely in the interior, such as brass or cast-iron saddles for doors; but never including the fittings connected with the plumbing.

BUILDERS' JACK. (See Jack.)

BUILDING. *A.* The art and the practice of putting together material in such a way as to produce a structure of some elaboration; especially, in architectural usage, a dwelling house, hall for meeting, place of worship, or the like.

B. The structure so put together and composed.

In sense *A* the term differs from Architecture in excluding all idea of artistic treatment; and it differs from Construction in excluding the idea of scientific or highly skilful treatment. Building may be poor, may be commonplace, ugly, insufficient, or otherwise of small importance.

The building of those earliest races of men who first emerged from the lowest savagery has always been strictly confined to the use of such material as comes easiest to hand. Thus, in the forest grown countries the use of saplings and branches for the main structure, and of leafy boughs or large leaves for thatch and keeping out the rain, is universal; but where such materials are not available, building, although it may develop more slowly, is none the less undertaken with stones, mud, clay, and the like. Even where men have lived in caves, or in excavations in the face of a cliff, building is resorted to at an early stage of their development to complete their protection or their defence; and in these cases, such materials as stone and clay are usually accessible and are found more efficacious. The same truths hold good throughout nearly all the natural development of building; and an advanced stage of mechanical civilization is reached before building materials are brought from a great distance. There are exceptions to this rule; thus, the Egyptians at a very early epoch became skilful in moving to the water's edge and in transporting by water very large blocks of stone worked in the quarries on the upper Nile and floated down the stream. At the same time, however, the ordinary building of the people and the greater part of the larger and more splendid structures were built of material found ready at hand. The result of this strong tendency to save trouble and expense is found in the sharp distinction between two kinds of building and the rarity of their combination in one and the same structure.

These two kinds of building are, first, that which may be called cage building; in which long, slender joists, bars, beams, logs, stems of bamboo and stems of palm, and the like are combined to form an openwork box, the interstices of which are filled up or covered over afterward by material secured to the uprights, the horizontals, and diagonals. This structure is as visible in an American balloon frame house or in the modern steel cage building as in a New Zealander's hut. It is but a slight modification of it which obtains in the half-timbered house where the interstices are filled up with masonry. This method of building has prevailed for thousands of years in China, along the banks of the Nile, in Japan, in Northern Europe, and in other lands where the materials are easy to obtain.

The other kind of building is the solid kind. In this a combination of walls is carried up from the ground, and these walls may be built of stones roughly heaped together or slightly dressed, or of clay cut or pressed into uniform shapes and dried in the sun, or of mud of some tenacious kind; but this last material requires a backing, a frame or skeleton, to keep it in place, and here again is a partial combination of the two systems of building. Walls built solidly in this manner require for the roofing of the enclosure within them, either a resort to the first-named system of building,— the cage system,— or they require the use of peculiarly fortunate material and the employment of unusual constructional and mechanical skill. The rare instances in the history of building in which roofs are made of slabs of stone, of corbelled courses of stone, or of true vaults, are instances of the difficulty found by half-civilized man in closing his room at the top by the materials used in what we call masonry. — R. S.

In addition to the works mentioned below, see the bibliographies under Iron Construction; Masonry; Wood, Construction in.

F. E. Kidder, *Building Construction and Superintendence*; Sir John Anderson, *The Strength of Materials and Structures*, London, 1887, 12mo; *Baukunde der Architekten, unter Mitwirkung von Fachmännern der verschiedenen Einzelgebiete, bearbeitet von den Herausgebern der Deutschen Bauzeitung und des Deutschen Baukalenders*, 2 vols., 8vo, Berlin, 1890; Max Becker, *Handbuch der Baukunde des Ingenieurs*, text 5 vols., 4to plates 5 vols. folio, Leipzig, 1882; Théodore Château, *Technologie du Bâtiment, ou étude complète des matériaux de toute espèce employés dans les constructions*, Paris, 1880, 2 vols., 8vo; A. [illegible], *Éléments de constructions civiles, art de bâtir, composition des édifices, etc.*, Paris, 1882, 1 vol., 8vo; *Notes on Building Construction*, London, 4 vols., 8vo, 1875; also by the same author, *Advanced Building Construction*, London, 1892 (both of the above issued for the South Kensington Schools); F. E. Kidder, *Architect's and Builder's Pocket Book*; M. Winter, *Die Dach constructionen nach den verschiedenartigen Formen und Bedingungen*, Berlin, s. d., 1 vol. text, 1 vol. plates; G. A. Breymann and H. Lang, *Allgemeine Bau-constructionslehre mit besonderer Beziehung auf das Hochbauwesen*, Leipzig, 1881, 4 vols.; Léopold [illegible], *Traité pratique de la construction moderne et description du matériel employé par les constructeurs*, Paris, 1877, 2 vols., 1 ho.; Charles H. Haswell, *Mechanics' and Engineers' Pocket Book of Tables, Rules and Formulas*, etc., New York, 1891; Banister Fletcher, *Quantities, a Text-book for Surveyors in tabulated form*, London, 1880; Glenn Brown, *Healthy Foundations for Houses* (reprinted from the *Sanitary Engineer*), New York, 1885; Jules Gaudard, *Foundations*, translated by L. F. Vernon Harcourt, M.A., New York; George T. Powell, *Foundations and Foundation Walls for all classes of Buildings*, New York, 1889; R. Guastavino, *Essay on the Theory and History of Cohesive Construction applied especially to the timbrel vault*, Boston, 1893; Viollet-le-Duc, *Dictionnaire Raisonné*, article "Construction," and translation of same, *Rational Construction*, by G. M. Huss.

BUILDING APPLIANCES. Implements, fittings, and machinery used by builders in preparing material and in erecting or repairing buildings. (See Centring; Crab; Crane; Derrick; Elevator; Hod; Hod Elevator; Hoistway; Lift; Scaffold.)

BUILDING LAW. (See Legislation.)

BUILDING PAPER. Paper used in immediate connection with building, usually either to provide warmth, or to serve as a deafening. Many patent papers are in the market, the general tendency of such manufacture being toward heavy and soft material, as thickness is needed while strength would be unimportant. The use in the United States of paper applied between the first sheathing and the outer clapboards in all kinds of frame buildings has proved most useful to the comfort of the houses so protected.

BUILDING SURVEYOR. A person whose business it is to examine and report on existing buildings and their appurtenances, with regard to their safety, sanitary condition, general state of repair, or other qualities. The title is, however, not specific, and the work described is usually undertaken by an architect, builder, or similar professional man; also, sometimes, by a surveyor of any kind, as a quantity surveyor.

BULFINCH, CHARLES; architect; b. Aug. 8, 1763 at Boston, Massachusetts; d. April 15, 1844.

The earliest native architect of Boston. Bulfinch graduated at Harvard College in 1781, and between 1785 and 1787 travelled in Europe. He visited Paris while Thomas Jefferson (see Jefferson, T.) was minister to France, and spent three or four months in Italy. After his return his first work was the Doric column erected to take the place of the old wooden beacon on Beacon Hill (Boston). In 1796 he undertook the Franklin Place improvement in which his entire fortune was lost. July 4, 1795, Bulfinch laid the corner stone of the State House in Boston (finished 1798). He finished the McLean Hospital, Somerville, in 1818, and in the same year received the commission for the General Hospital in Boston. Jan. 8, 1818, Bulfinch succeeded B. H. Latrobe (see Latrobe) as architect of the Capitol in Washington. He built the rotunda according to Latrobe's plans, and added, from his own designs, the portico and approaches on the western side. He finished the Capitol in 1830. (For changes after 1851, see Walter, Thomas U.)

Ellen S. Bulfinch, *Life and Letters of Charles Bulfinch*; Winsor, *Memorial History of Boston*; Quincy, *Municipal History of Boston*; Howard, *Architects of the National Capitol*, in *International Review*; Glenn Brown, *United States Capitol*.

BULK. A small structure projecting from a building, as a booth or stall.

BULKHEAD. *A*. The top of a bulk; hence, sometimes the bulk itself.

B. In the United States, in modern times, a boxlike structure, generally framed of wood or iron, rising above a floor or roof, either as a means of lighting by a window or windows in its sides, or to cover and accommodate the head of a staircase, elevator, or the like.

BULKHEAD LIGHT; WINDOW. Any window in a bulkhead; a window or windows constructed as a bulkhead. Specifically, in the United States, such a window arranged to light a cellar; the top of the opening in the outer wall being higher than the cellar ceiling and surrounded by a bulkhead which projects into the room above; commonly forming a broad window seat, or a platform behind a show window.

BULLANT, CHARLES; architect or builder.

A nephew of Jean Bullant, of Écouen, who worked under his direction at Saint-Denis after 1573 (see Bullant, Jean).

Berty, *Les Grands Architectes français*, p. 167.

BULLANT, JEAN; architect; b. about 1515; d. Oct. 10, 1578.

In his *Reigle Généralle* Bullant asserts that he measured the antique in Rome. He very early entered the service of the Constable Anne de Montmorency. The result of their coöperation was the more interesting part of the château of Écouen, France. The original design and the older work are doubtless by another person (see Baillard, Charles). The classical influence of Bullant appears gradually and becomes predominant in the wing to the right of the main entrance built about 1550. He built the main entrance also (destroyed), and the portico, copied from the temple of Castor and Pollux at Rome, which was added to the left wing, the first appearance of the colossal order in France. This work especially marks the transition from the early Renaissance to the clearly defined French classic style. Oct. 25, 1557, Bullant was appointed *contrôleur des bâtiments royeaux*, but, like Philibert de l'Orme (see De l'Orme, P.), lost his office after the death of Henri II. (July 10, 1559). A period of about ten years follows in which no building of importance can with certainty be ascribed to him. Palustre (op. cit., Vol. I., p. 79) supposes that during this time he was occupied with the *Petit Château* of Chantilly, the reconstruction of the Château of Fère-en-Tardenois, and the improvement of various churches in the vicinity of Écouen, as at Bellay, Sarcelles, Villiers-le-Bel, etc.

The great Constable Anne de Montmorency was killed at the battle of Saint-Denis, Nov. 10, 1567. The mausoleum for himself and his wife, Madeleine de Savoy, in the church at Montmorency, was begun by Bullant soon after. The work continued a long time and appears never to have been completed. (For the sculpture, see Prieur, Barthélemy.) Fragments of this monument, which was destroyed in the Revolution, are now in the Louvre. In 1570 Bullant superintended the works at the chapel of the Valois, at Saint-Denis, near Paris. Jan. 8, 1570, he succeeded Philibert de l'Orme as architect of the Tuileries, and built the pavilion connecting with De l'Orme's work on the south side. In 1572 Catherine de' Medici abandoned the Tuileries, and Bullant began for her the great *Hôtel-de-la-Reine*, which afterward came into the possession of Charles de Bourbon, Compte de Soissons, and was called Hôtel de Soissons, Paris. In the eighteenth century it was destroyed, except the great column built in imitation of Trajan's column at Rome, which still remains. The first of Bullant's first book appeared in 1561 under the title *Recueil d'Horlogiographie*, quarto, with engravings on wood. The second part followed the next year, and with the first formed a volume entitled *Petit Traicté de Géométrie et d'Horlogiographie pratique*, 1562. His second work *Reigle généralle d'Architecture*, came from the press May 27, 1564. A second edition was printed in 1568. In 1619 an edition was issued by N. Pilouet, *reveue et corrigée par Monsieur de Brosse, architecte du roy* (see Brosse, Salomon de). Bullant died at Écouen, Oct. 10, 1578.

Berty, *Les Grands architectes français*; Palustre, *La Renaissance en France*; Mrs. Pattison. *The Renaissance of Art in France*; Le Marquis Leon de Laborde, *Les comptes des bâtiments du Roi*; Ph. de Chennevières, *Archives de l'art français*.

BULLANT (of Amiens), **JEAN**; architect.

The records concerning Jean Bullant of Amiens usually refer to two persons. There may have been more. One Jean Bullant began in 1524 the church of Saint Jean hors les-Murs, at Amiens (Somme, France), and in 1525, the tour Le Compte, at Lucheu. According to the records of the *Echevinage*, a Jean Bullant was *Machon de la grande église* (cathedral), in 1532.

In 1569 another Jean Bullant was charged with the reconstruction of the belfry of Amiens, and made *un pourtraict sur six feuilles de papier collés ensemble.* From 1565 to 1574 he was occupied with the fortifications of the city of Amiens.

Dusevel, *Recherches historiques sur les Ouvrages exécutés dans la ville d'Amiens*, etc.; Palustre, *Renaissance en France*.

BULLET, PIERRE; architect; b. 1639; d. 1716.

Bullet was a pupil of François Blondel (see Blondel, Fr.). In 1670–1672 he assisted Blondel in the construction of the Porte Saint-Denis, Paris. He afterward built the Porte Saint-Martin from his own designs. In 1675 Bullet built the great altar of the church of the Sorbonne, Paris. In 1676 he published his *Plan de Paris*.

Lance, *Dictionnaire*; Ministère de l'instruction publique, *Inventaire général*, *Monuments religieux*, Vol. I., p. 239.

BULL'S EYE. *A*. A small circular window or opening.

B. A piece of glass having a circular convexity on one or both sides, commonly used in a circular leading in stained glass designs — a Roundel.

BULL'S NOSE. The projecting obtuse angle formed by two faces when the corner is rounded outwardly, as in the salient corner of a plastered partition, and, in a few instances, one of the principal angles of an exterior.

BUNK. A standing bedstead of simple character, such as is fitted in the cabin of an officer on shipboard, or is roughly built of boards in a temporary lodging house, or the barrack of a mining camp or the like. Bunks are often arranged so as to form the top of a chest of drawers, the space beneath them being thus utilized, and the bunk itself being raised high above the deck or floor.

BUNK ROOM. A dormitory for a number of men; especially, in the United States, the dormitory of a firehouse, although usually provided with ordinary bedsteads, and not bunks.

BUNZ, JOHANN VITUS; iron worker.

In 1713 Bunz made the iron screen in the choir of the cathedral of Ulm (Würtemberg, Germany).

Lubke, *Renaissance in Deutschland*.

BUONACCORSI, PIERINO (PERINO DEL VAGA of Florence); painter and decorator; b. 1499; d. 1547.

One of the assistants of Raphael in decorating the Stanze and Loggie at the Vatican. After the sack of Rome, in 1527, Perino entered the service of the great Admiral Andrea Doria in Genoa, in whose palace he decorated the vestibule, a loggia, and a series of apartments in the second story. He returned to Rome, and for Paul III. (Pope 1534–1549) and the Farnese family made designs for numerous crystals, embroideries, stuccoes, carvings in wood and stone, etc.

Müntz, *Renaissance*; Crowe and Cavalcaselle, *Raphael*.

BUONAMICO. (See Bonamicus.)

BUONARROTI-SIMONI, MICHELANGELO; sculptor, painter, architect, and poet; b. Mar. 6, 1475; d. Feb. 17, 1564.

The Buonarroti-Simonis were an old burgher family of Florence. Michelangelo was born at Caprese in the Casentino (Tuscany), while his father Lodovico (d. 1534) was podestà of that village. April 1, 1488, he was apprenticed to the painters Domenico and David Ghirlandaio for three years. He was one of the boys selected to study from the antique statues collected in the gardens of the monastery of S. Marco, Florence, and there attracted the attention of Lorenzo de' Medici (b. 1448; d. 1429), who invited him to his palace, where Michelangelo lived and worked until his patron died. In 1491 Michelangelo came in contact with Savonarola (b. 1452; d. 1498), whose influence upon him was very great. Through the assistance of the prior of the convent of S. Spirito, for whom he made a crucifix, he had abundant opportunity for dissection, and began that exhaustive study of anatomy to which he devoted a large part of his life. Just before the expulsion of the Medici (Nov. 8, 1494), Michelangelo went to Bologna, where he made one of the kneeling angels of the *Arca* of S. Domenico (see Niccolò del Arca). Returning to Florence in 1495 he made a statue of S. John, supposed to be now in Berlin, and a sleeping Cupid which was sold to the Cardinal Riario in Rome as an antique. Going to Rome, June 25, 1496, he made there at this time the Bacchus of the Museo Nazionale, Florence, a Cupid, probably that of the South Kensington Museum, and the beautiful Pietà of S. Pietro, Rome, for which the contract was signed Aug. 26, 1498. Michelangelo returned to Florence in 1501 and began the colossal statue of David, in August of that year. It was placed in position before the Palazzo della Signoria, June 8, 1504, and is now in the Accademia, Florence. The Madonna of Bruges was probably made at about this time, and a bronze David which was sent to France, and drifted to the château of Villeroy, where it disappeared. The two roundels of the Royal Academy, London, and the Museo Nazionale, Florence, and the picture of the Holy Family at the Uffizi doubtless belong to this early period. In 1504 he began the famous cartoon representing soldiers alarmed while bathing in the Arno (the so-called "Battle of Pisa"). It was made as a companion to Leonardo da Vinci's "Battle of Anghiari," begun 1503 (see Leonardo da Vinci). This cartoon, which influenced the art of the Renaissance more than any other work, was finished in 1506, but abandoned a few years later and finally destroyed.

In 1505 Michelangelo was called to Rome by Julius II. (Pope 1503–1513), and in April of that year began the mausoleum of the Pope, a work which extended through many years of his life and was the source of endless irritation and disappointment. A part of the design, with the statue of Moses, was finally set up in the church of S. Pietro in Vincolo, Rome, after 1542. Disturbed by some misunderstanding with the Pope about the mausoleum, Michelangelo abandoned Rome for Florence before May 2, 1506. In December of the same year he made his peace with the Pope at Bologna, and executed a bronze statue of him which stood over the door of the church of S. Petronio (Bologna), until Dec. 30, 1511, when it was destroyed. At Bologna, Michelangelo came in contact with the work of Giacomo della Quercia (see Giacomo della Quercia), which had a powerful influence upon his compositions for the ceiling of the Sistine chapel (Vatican, Rome). This ceiling, begun in the summer of 1508, represents scenes from the Creation, surrounded by a superb setting of architecture and figures. It was finished in October, 1512. Julius II. was succeeded by Giovanni de' Medici, Leo X. (Pope 1513–1521). Leo found little for Michelangelo to do in Rome. In 1515 the Pope conceived a scheme for the construction of a facade for the church of S. Lorenzo in Florence, for which designs were made by Michelangelo, Giuliano da San Gallo (see San Gallo, Giuliano da), Andrea and Jacopo Sansovino (see Sansovino, A. and J.), and others. That of Michelangelo was preferred. From 1516 to 1520 Michelangelo was occupied in the mountains of Carrara and Serravezza, building roads, opening quarries, and preparing marbles for this façade, which was never built. Leo X. was succeeded by Adrian VI. (Pope 1522–1523), and he in turn by Giuliano de' Medici, Clement VII. (Pope 1523–1534). Clement employed Michelangelo in the construction of the new sacristy of S. Lorenzo, Florence, and the tombs of the two dukes, Giuliano and Lorenzo de' Medici. The sacristy was finished before 1524. The magnificent sculpture of the two tombs was kept in hand for a long period, and not actually placed in position until after 1534. Michelangelo began the Laurentian library in Florence in 1526. During the siege of Florence in 1530, he was made controller general of the works of defence.

In 1534 Michelangelo settled in Rome for the remainder of his life. Under the patronage of Paul III. (Pope 1534–1549) he completed the decoration of the Sistine chapel by painting the picture of the "Last Judgment" (begun 1534, finished 1541). The decorations of the Pauline chapel were painted between 1542 and 1549. About 1544 he was called in to complete the Farnese palace (Rome), which had been placed in charge of Antonio (II.), da San Gallo. The third story, with the cornice and much of the court, are attributed to Michelangelo. He had, however, from this time until his death very able assistants, such as Vignola (see Barozzio, Giacomo) and Giacomo della Porta (see Giacomo della Porta), and it is impossible to separate their work from his. (Garnier, *Michel-Ange architecte* in *L'Œuvre et la Vie de Michel-Ange.*) After the death of Antonio (II.) da San Gallo, in 1546, Michelangelo became architect of S. Peter's, and worked on that building until his death without compensation. He returned to the main features of the design of Bramante (see Bramante), and, in 1557, made a model of the cupola, according to which it was built after his death by Giacomo della Porta. The dome as constructed doubtless represents Michelangelo's conception very perfectly. The *Porto Pia* (Rome) is also ascribed to him. The reconstruction of the Capitol was begun with the placing of the statue of Marcus Aurelius, in 1538. Michelangelo designed the main features of the present buildings, which were carried out after his death. He rebuilt the great hall of the Thermae of Diocletian (now the church of S. Maria degli Angeli), which was again remodelled in 1749 by Vanvitelli (see Vanvitelli).

Passerini, *Bibliografia di Michelangelo*; J. A. Symonds, *Life of Michelangelo*; Heath Wilson, *Life and Works of Michelangelo*; J. S. Harford, *Life of Michel Angelo*; Hermann Grimm, *Das Leben Michelangelos*; *L'Œuvre et la Vie de Michel-Ange*; Gotti, *Vita di Michelangelo Buonarroti*; Condivi, *Vita di Michelangelo*; Vasari, Milanesi ed.; Vasari, Blashfield-Hopkins ed.; Milanesi, *Lettere di Michelangelo*; Duppa, *Life and Literary Works of Michel Angelo*; Anton Springer, *Raffael und Michel Angelo*; Symonds, *Renaissance*; Durm, *Die Domkuppel der Petrus Kirche in Rom*; Russell Sturgis, *Michelangelo* in *Johnson's Cyclopedia*; Strack, *Baudenkmaler Roms*; Michaelis, *Michelangelos Plan zum Capitol.*

BUONO. (See also Bono.)

BUONO OF PISA; architect.

Buono and his uncle, Pietro, were called from the monastery at Monantulano in 990 to build the church of San-Michele-in-Borgo, at Pisa, on the ruins of a Roman temple. He brought columns for the church from Rome and Elba. Of his work the crypt and some of the columns of the nave still remain. A kneeling figure in a niche of the façade is supposed to be his portrait.

Rohault de Fleury, *Monuments de Pise*, p. 39.

BUONTALENTI, BERNARDO; architect, sculptor, painter, landscape architect, miniaturist; b. 1536; d. June 6, 1608.

A pupil of Vasari and of Giulio Clovio, the miniaturist. For the dukes Francesco I. (b. 1541; d. 1587) and Ferdinando I. (b. 1551; d. 1609) de' Medici he designed the villas of Pratolino, Artiminio, Marignolle, and Magia, near Florence. He built the additions to the Palazzo Vecchio, Florence, on the Via dei Leoni, the *Tribuna* of the Uffizi, and the gallery connecting the Uffizi with the Pitti palace. He continued the arrangement of the Boboli Gardens, begun by Tribolo (see Tribolo), and built the grotto and other architectural adornments there. Buontalenti fortified Porto Ferraio, Livorno, and Grosseto. The *Palazzo Reale*, in Siena, and the *Palazzo Nonfinisto*, in Florence, are attributed to him.

Müntz, *Renaissance*; Redtenbacher, *Architektur der Italienischen Renaissance*; Burckhardt, *Cicerone*; Vasari, Milanesi ed., Vol. VII., p. 614.

BUORA, GIOVANNI ZUANE DI ANTONIO OF OSTENO; sculptor and architect.

Buora appears frequently in the Venetian records, especially in association with Pietro Lombardo (see Lombardo, Pietro), in the construction of the Scuola di S. Marco in Venice, in 1489 and 1490. He made the doorway of the church of S. Zaccaria, Venice. In 1494 he began the *dormitorio* of the monastery of S. Giorgio Maggiore, Venice.

Paoletti, *Rinascimento in Venezia*.

BURGES, WILLIAM; architect; b. 1827; d. April 20, 1881.

He was educated at University College and King's College, London, and was also a pupil of Edward Blore and Digby Wyatt (see Blore and Wyatt), and applied himself especially to mediæval architecture. In 1856 he won the first award in the competition for Lille cathedral. Burges designed the cathedral of Brisbane, in Queensland (1859), and the cathedral of Cork (Ireland), his most important work (1862). In 1865 he restored Cardiff Castle. He prepared designs for the new law courts in the Strand, and for the decoration of S. Paul's cathedral (London), which were not executed. He designed Trinity College in Hartford, Connecticut.

Stephen Lee, *Dictionary of National Biography*.

BURGHLEY (BURLEIGH) HOUSE. A large English country house, close to the town of Stamford, Lincolnshire; built by John Thorpe in the reign of Queen Elizabeth.

BURKART; bell founder.

In 1461 he made the storm bell (*Wetterglocke*) of the cathedral of Strassburg. He appears in the records as bell-founder of the cathedral (*Werks Glockengiesser*). He is supposed to have refounded in 1458 the bell called Mutte, at the cathedral of Metz.

Gerard, *Les artistes de l'Alsace au Moyen Âge*.

BURKLEIN, FRIEDRICH; architect; b. March 1, 1813; d. Nov. 4, 1872.

Burklein came to Munich (Bavaria), about 1828, and entered the atelier of Gärtner (see Gärtner). He held the offices of *Bauconstructeur Regierungs-inspector* and Professor in the *Polytechnische Schule* in Munich. He went with Gärtner to Greece, and assisted him in the construction of the royal palace at Athens. He assisted the King Maximilian II. (b. 1811; d. 1864) in his development of the city of Munich. Burklein's chief work was the laying out of the Maximilianstrasse and construction of the Maximilianeum. He worked in a style peculiar to himself (*Neuer Baustil*), a combination of Romanesque and Renaissance.

Allgemeine Deutsche Biographie.

BURLINGTON, EARL OF. (See Boyle, Richard.)

BURLINGTON HOUSE. Originally the London residence of the Earl of Burlington; built in the early years of the eighteenth century. Its most interesting part architecturally was the colonnade which formed the enclosure on the side of Piccadilly; but this was destroyed when the building was transferred to the use of the Royal Academy, and wings, with a building on Piccadilly, were erected, making a quadrangle of the whole. The Royal Society, the Society of Antiquarians, and other smaller associations occupy rooms in the building.

BURMAH, ARCHITECTURE OF. (See Farther India, Architecture of.)

BUSCHETTO. (See Buschetus.)

BUSCHETUS (BUSKETUS, BUSCHETTO); architect.

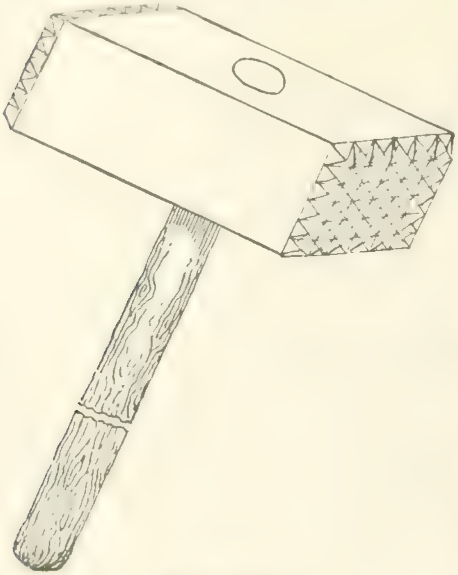
The first architect of the cathedral of Pisa. The date, 1006, in the inscription on his monument, which still stands in the cathedral, is probably that of the commencement of the building. The inscription on the façade, with the date 1063, is supposed to refer to a subsequent enlargement (Mothes, Vol. II., p. 722). In a contract of Dec. 2, 1105, Buschetto is mentioned as one of four architects who had worked on the cathedral; the others being Uberto, Leone, and Signoretto. He was probably a Byzantine Greek.

Mothes, *Baukunst des Mittelalters*; Rohault de Fleury, *Monuments de Pise*; [illegible] *Mittel Italien*; Vasari, Milanesi ed., Vol. I., p. [illegible]

BUSCHPERGER, MARTIN; architect.

Martin Buschperger, of Osnabrück, rebuilt the *Burg*, in Vienna, during the reign of the Archduke Albrecht I. (b. 1250; d. 1308).

BUSH HAMMER. In stone dressing, a hammer used in finishing the harder stones. It has a prismatic head, the ends of which are square, and divided into a number of pyramidal points.



Bush Hammer.

BUTLER'S PANTRY. Originally, and still in England, a room for the use of the butler, who has charge of the service of wine, and the service and stowage of plate. In the United States, a small serving room adjoining the dining room, and furnished with shelves, glazed cupboards or dressers, a sink, and other conveniences, for the stowage and care of the silver and fine china, glass, and crockery, required for the table.

BUTLERY. The same as Buttery, or Butler's Pantry, especially in the English sense.

BUTMENT. Same as Abutment.

BUTMENT CHEEK. The face of the material surrounding a mortise, and against which abut the shoulders surrounding the tenon.

BUTT (n.) (I.). The end or back of a member or piece; especially, such part when prepared for another member to butt, or abut against it. Specifically, the larger of the two ends of a log; the back edge of a door; the squared end of a timber prepared for framing and the like.

BUTT (n.) (II.); and compounds. Same as Butt Hinge, and compounds (under Hinge).

BUTT (v. t. and v. i.). To join squarely, as when two girders meet end to end, forming a Butt Joint. (See Abut, v.; Butt Joint, under Joint.)

BUTTERFIELD, WILLIAM, F. S. A.; architect; b. Sept. 7, 1814; d. Feb. 23, 1900.

He devoted himself to the study of Gothic architecture, and was especially successful in the introduction of colour by the help of brick, stone, marble, and mosaic. The earliest of his more important works is the church of All Saints, Margaret Street, London, begun in 1849. He designed S. Augustine's College, Canterbury; all the buildings of Keble College, Oxford; the cathedral of Perth; Balliol College chapel, Oxford; S. Michael's Hospital, Axbridge; the school buildings at Winchester College; the chapel, quadrangle, and other buildings at Rugby School; Rugby parish church; S. Alban's, Holborn; S. Augustine's, Queen's Gate, and churches at Enfield, Winchester, Dover Castle, and Tottenham. All the work mentioned is in Great Britain. There are several important buildings by Butterfield in Australia (which see).

Men and Women of the Time; Eastlake, *Gothic Revival.*

BUTTERY. Originally, a Butlery, that is, the storeroom for wines, liquors, and the like, in the charge of the butler. In later, but still early, times, used also for the storage of such provisions as are capable of being preserved, and are, therefore, stored in relatively large quantities, such as flour, bacon, cheese, salt fish, and the like. Later, and in modern times, a general storeroom for provisions; the wines, etc., being kept in the cellars.

BUTTERY BAR. A ledge or shelf forming a bar on the top of a Buttery Hatch.

BUTTERY HATCH. A half door giving entrance to a buttery and over which are served out the contents of the buttery.

BUTT HINGE. (See under Hinge.)

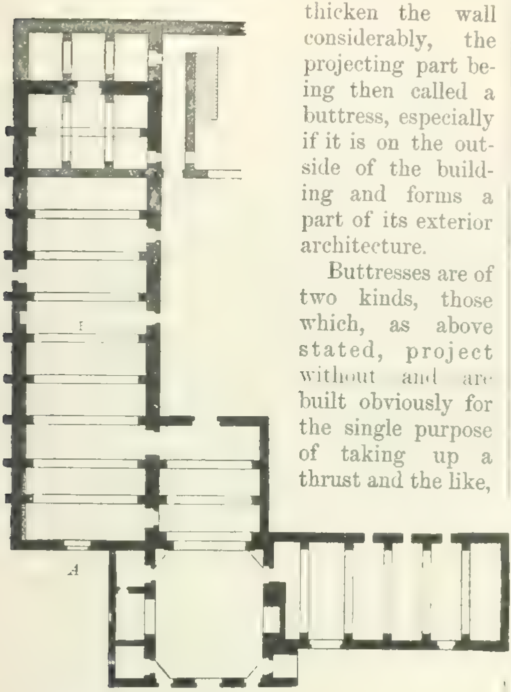
BUTTON. Any small projecting member, generally movable or forming part of a movable object, as a small knob; anything more or less resembling a button in the ordinary sense. Specifically: —

A. A piece of wood or metal, secured to the frame of a door or the like by a pin or screw on which it is free to turn so as to secure the door by extending across its edge, and to allow the door to open when it is turned away.

B. In connection with electrical apparatus, a push button.

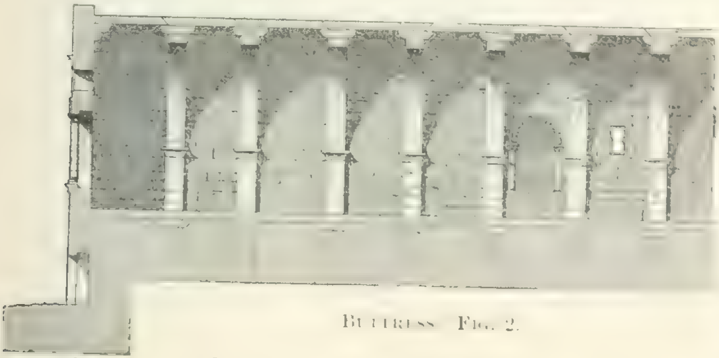
BUTTRESS. Any structure put up to support or partly support or maintain another, as by resisting its tendency to fall or move sidewise; a stay or prop. In ordinary use, however, the term is limited to a piece of masonry like a pier built either in close connection with a wall which it is intended to stiffen, or standing isolated, or nearly so, to resist the thrust of a flying buttress. A buttress has no utility except where there is a concentrated pressure or strain in one point along one line; thus, if a wall is pressed outward along its whole extent, there is nothing for it but to strengthen that wall, as by thickening it, and the material so added would hardly be called a buttress. If, however, the thrust of an arch or vault comes against a certain small part of the wall, the natural precaution is to build a buttress at that point, or, in other words, to thicken the wall considerably, the projecting part being then called a buttress, especially if it is on the outside of the building and forms a part of its exterior architecture.

Buttresses are of two kinds, those which, as above stated, project without and are built obviously for the single purpose of taking up a thrust and the like, and those which are walls dividing rooms, compartments, or bays of the interior. Thus, in a building like the Basilica of Maxentius or the great hall of the Baths of Diocletian the thrust of the vaults from the nave is taken up by the heavy walls which divide the bays of the aisles or lower wings of the building. In antiquity, the thought seems never to have occurred to any builder to build buttresses outside of the walls. The very essence of skilful planning was to so combine the dividing walls or partition walls as to provide sufficiently



BUTTRESS: FIG. 1. – AN EARLY FORM: THE MASS PARTLY WITHIN AND PARTLY BEYOND THE WALLS. PALACE AT CHAQQA, SYRIA.

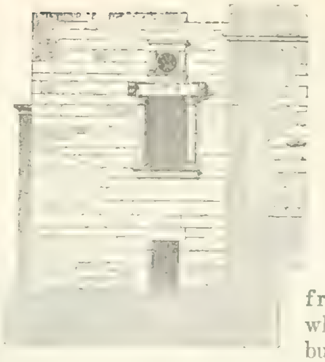
See Fig. 2, partial section, showing transverse arches, *B*, and Fig. 3, partial end wall at *A*.



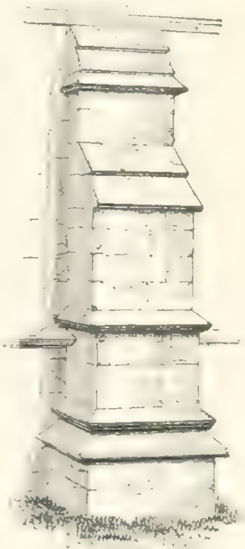
BUTTRESS: FIG. 2.

by their means for resistance to such thrust. A curious instance of the survival of this scheme is seen in the church at Trier or Trèves called the Church of Our Lady (Liebfrauenkirche) which, although a building in an almost pure Gothic style, has a very peculiar plan, evidently combined with the purpose above stated. The numerous buttresses of Aya Sophia in Constantinople are in like manner included within the outer walls. These resist the thrust of arches of one hundred feet span which in their turn carry the pendentives of the great dome and of the two semidomes. In like manner S. Peter's at Rome has no exterior buttress; but this is a deliberate return to the classical practice, the external buttress being assumed a purely mediæval feature.

The buttresses of the Romanesque churches are thin and slight, and in nothing is the feeble and unskilful building of the time more clearly shown than in this inability to see how naturally the buttresses could be increased individually in their projection from the wall so as to resist even the great thrust of the transverse arches by means of which the builders were trying to vault their aisles and their naves in those churches built without aisles. There are many instances of new buttresses built at later times to check the spread already begun of Romanesque vaulted roofs; several are named in the Sharpe Memorial, *The Domed Churches of*



BUTTRESS: FIG. 3.

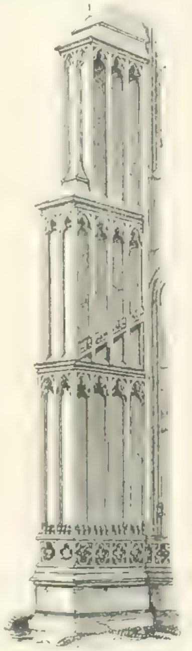


BUTTRESS OF AISLE WALL: WARMINGTON CHURCH, NORTHAMPTONSHIRE, c. 1260.

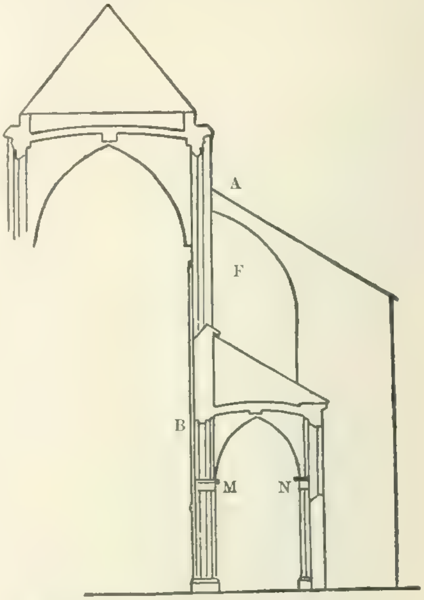
[illegible], and many more could be named: thus, the great nave of the abbey church at Vézelay has a system of flying buttresses and large buttress piers which were not added until the nave vault had already settled perceptibly. With the earliest appearance of the ribbed vault, forming the true commencement of Gothic architecture, the buttresses assumed very different proportions, and within a very few years they began to be built with a skilful adaptation of means to an end, as large and as boldly projecting as required. It was natural to make them much greater in projection than in width or thickness measured across the buttress, and, therefore, parallel to the main axis of the church. Those of the S. Chapelle — which are simple in their conditions as supporting the thrust of vaults raised high above the foundation of the church and which bear directly upon the buttresses without the necessity of any flying buttress to lead the thrust across an intervening space — have a total depth from in to out of three and a half times their general thickness, and their clear projection beyond the wall below the great windows and above the windows of the lower church is more than twice their thickness.

BUTTRESS: TWO AT ANGLE OF AISLE, OXFORD CATHEDRAL, C. 1330.

The buttress which is built on the outer side of the aisle of a three-aisled or five-aisled church, and which is used not only to resist the thrust of the aisle, but also to take the flying buttress which leads the thrust of the nave vault across the whole width of the aisle, is called very often a Buttress Pier. (See that term.)


BUTTRESS: PERPENDICULAR STYLE, THE FACES RICHLY PANELLED: DIVINITY SCHOOL, OXFORD, C. 1480.

In the chevet or curved western end of a large church it often happens that the buttress which shows without is a continuation of the wall dividing two of the radiating chapels, so that the whole depth of the piece of wall which takes up the thrust of the arches within by receiving them on its edge and transmitting their pressure throughout its whole mass may be eight times its thickness. It will be seen that in this instance a combination of the classical and mediæval systems has arisen naturally from the conditions of the plan.



FLYING BUTTRESS: DIAGRAM SHOWING ACTION

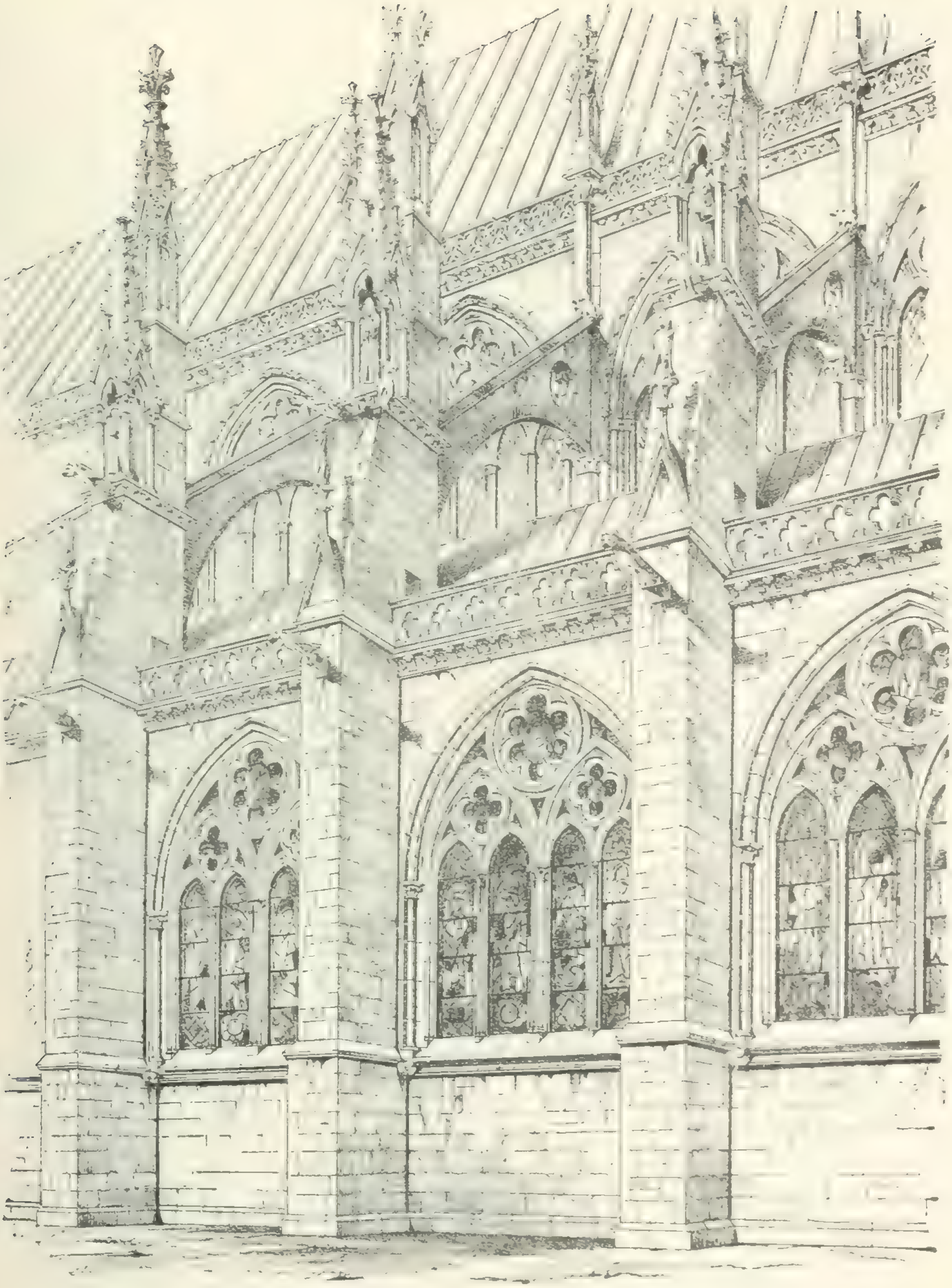
A. The flying buttress. *F*. The open space beneath arch of flying buttress. *B*. The crown of one of the arches supporting clerestory wall. *M N*. Arch across the aisle which would have been loaded too heavily but for the opening above, *F*.

For a full discussion of buttress and buttressing see treatises on Gothic Architecture.

— R. S.

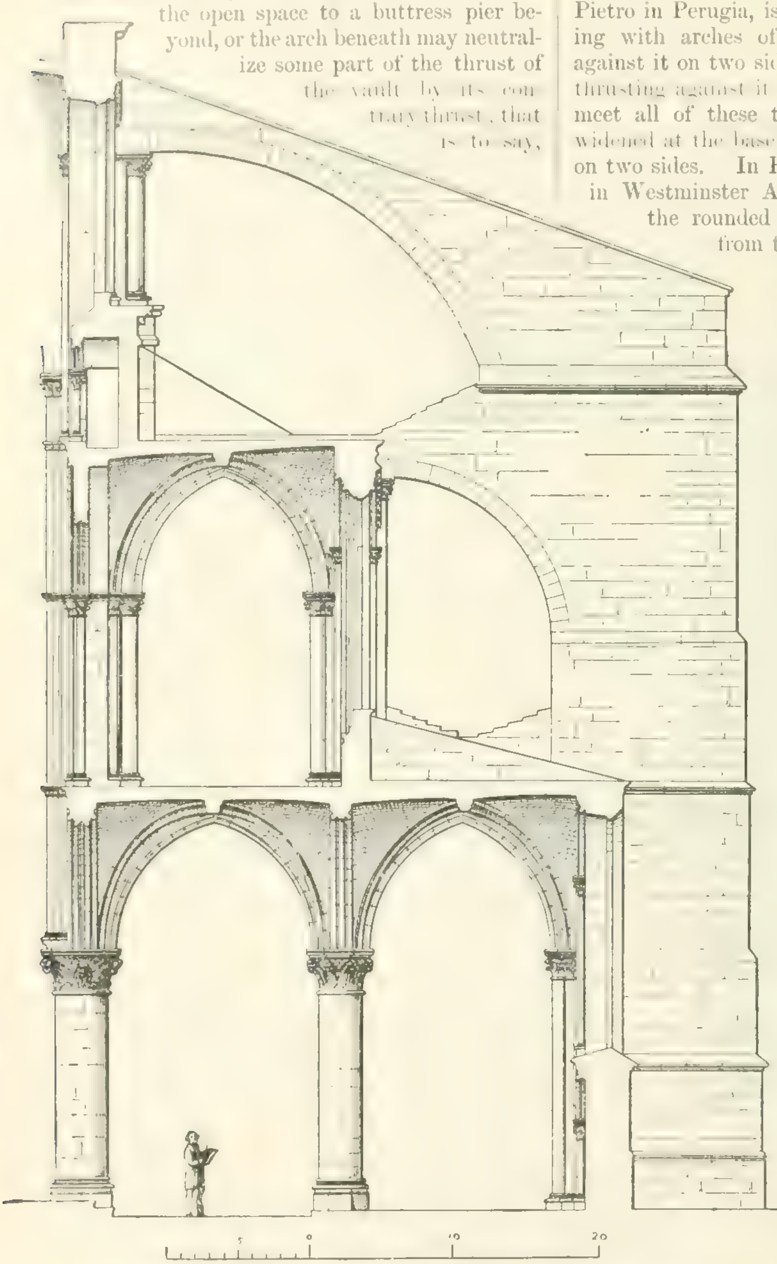
Flying Buttress. A structure of masonry by means of which the thrust of a vault is taken up or neutralized without the immediate proximity of a great mass of masonry, such as an ordinary buttress or a buttress pier. The usual form of the flying

FLYING BUTTRESS: HARTLEPOOL CHURCH, DURHAM, C. 1250.



FLYING BUTTRESS, STRASBURG CATHEDRAL. NORTH SIDE OF NAVE

The perfected system, with heavy buttress piers buttress is a straight bar or band of stone carried by a half arch or similar arcuated structure; but the band of stone may act as a mere strut transmitting the thrust of the vault across the open space to a buttress pier beyond, or the arch beneath may neutralize some part of the thrust of the vault by its contrary thrust; that is to say, the flying buttress may be a simple brace or an active inward pressure. (See the analysis of the whole system in the article Buttress.) (Cut, cols. 105, 106.)



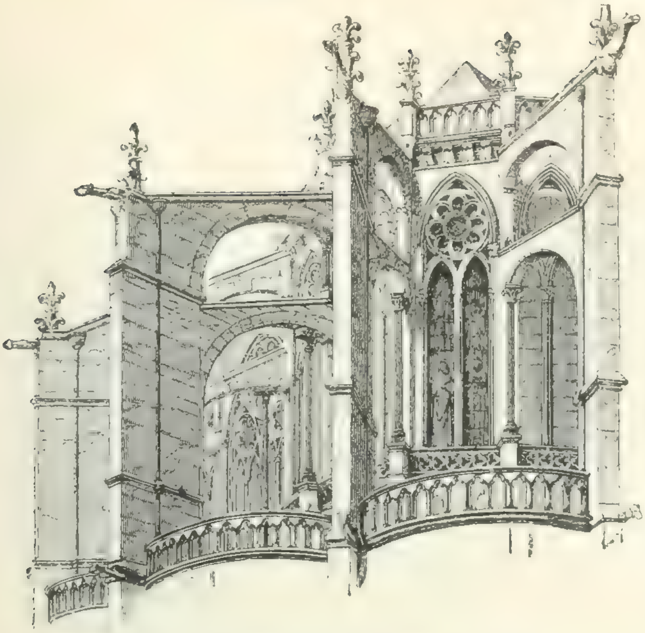
Flying Buttress: Church of S. Remy at Reims (Marne), France.

Diagram of arrangement of double-aisled church with two flying buttress systems.

BUTTRESS PIER. *A.* A pier which serves as a buttress while having another purpose, as when a pier dividing openings in an outer wall receives also the thrust of a vault within and is, therefore, shaped so as to resist that thrust. One such, in a gallery near the church of S. Pietro in Perugia, is the corner pier of a building with arches of the outer wall thrusting against it on two sides, and a groin vault within thrusting against it in a diagonal direction; to meet all of these thrusts the pier is greatly widened at the base and has a continuous batter on two sides. In Henry the Seventh's Chapel in Westminster Abbey the massive piers of the rounded apse, whose axes radiate from the centre of the curve, are buttress piers; and so are the massive octagonal shafts along the north and south sides; that is to say, they are primarily piers of vertical support and of an architectural design agreeing with that function; but they also act as buttresses to take up the thrust of the aisle vaulting.

B. That part of a buttress which rises above the point of thrust of a vault which it is intended to maintain, or above the roof of the building to which it is attached. Thus, in Gothic construction, the prismatic pier which rises above the aisle roof and takes the thrust of the flying buttress is sometimes called by this name. Such piers often are carried up vertically on the outer side; but on the inner side, toward the flying buttress, are built overhanging or corbelled inward, so that the thrust from within is partly counterbalanced by the tendency of the unsymmetrical pier to fall inward. (Cut, col. 106.) — R. S.

BUTTRESS TOWER. A towerlike structure which acts or seems to act as a buttress, as on either side of a great archway of entrance. In strong castles of the Middle Ages, the towers which flank the entrance are for defence, the discharge of arrows, bolts, and stones from the battlements or galleries of defence being intended to keep the assailant from the gate, and from trying to lower the drawbridge or portcullis. It is only modern ignorance of the conditions of mediæval fortifi-



Flying Buttress: Saint Denis, c. 1240.

Radiating system of rounded or polygonal east end; apsidal chapels between the buttress piers.

cation which has given rise to the term "buttress tower" as applied to these gateway towers. (Compare Buttress Pier.) — R. S.

BUZZER. (See Electrical Appliances.)

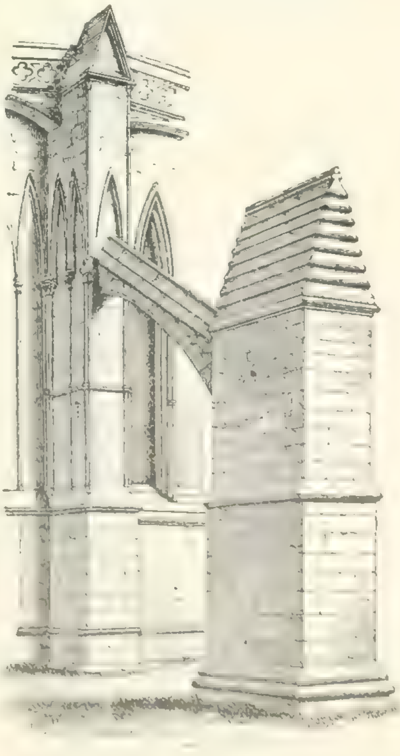
BYART. (See Biard.)

BYE-PASS. In a plumbing system a faulty connection between the back air pipe of a trap and other pipes, whereby an open passage is created for gases from the soil and waste pipe system into a house. — W. P. G.

BYRE. A cow stable or cow shed ; the term is used chiefly in Scotland and the north of England.

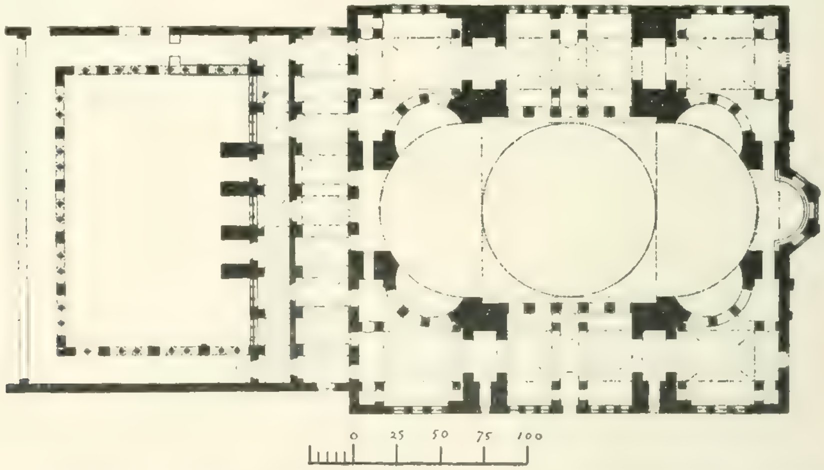
BYZANTINE ARCHITECTURE. Architecture of a style chiefly developed in the domains and during the existence of the Byzantine Empire, from which it spread westward into Italy, whence its influence radiated into France and Germany; and northward into Russia, where it still, to some extent, dominates ecclesiastical design. It was developed almost exclusively in ecclesiastical buildings, and was the distinctive style of the Eastern or Greek church, as the basilican style was of the Western (see Latin Architecture), both before and after the separation of the two. In spite of its long duration, covering the millennium from the fifth to the fifteenth century, it was in reality a style of transition, leading from the classic Roman architecture to the Romanesque and Gothic styles of the West on the one hand, and to the Moslem styles of the East on the other. Its chief distinction is the revolution in structural design brought about by the invention of the dome on pendentives, and its greatest monument — Hagia Sophia at Constantinople — is one of the really great buildings of the world ; yet the majority of its productions were small in scale and timid in construction, and it never carried to their logical conclusion the great principles exhibited in its early masterpieces. It thus presents the spectacle of an arrested development, of precocious and brilliant promise unfulfilled ; the decline of the empire began before its arts had reached their culmination.

Origins. With the fall of Rome, in 476, Constantinople became the chief city of Christendom in wealth, power, and culture. Situated at the gates of the East, it was for centuries the great *entrepôt* of commerce between Europe and Asia ; and while it inherited the structural and decorative traditions of Roman art, it was in reality an Asiatic Greek city, and subject to the influence of Oriental taste. Greeks from Asia Minor were in a large measure the archi-



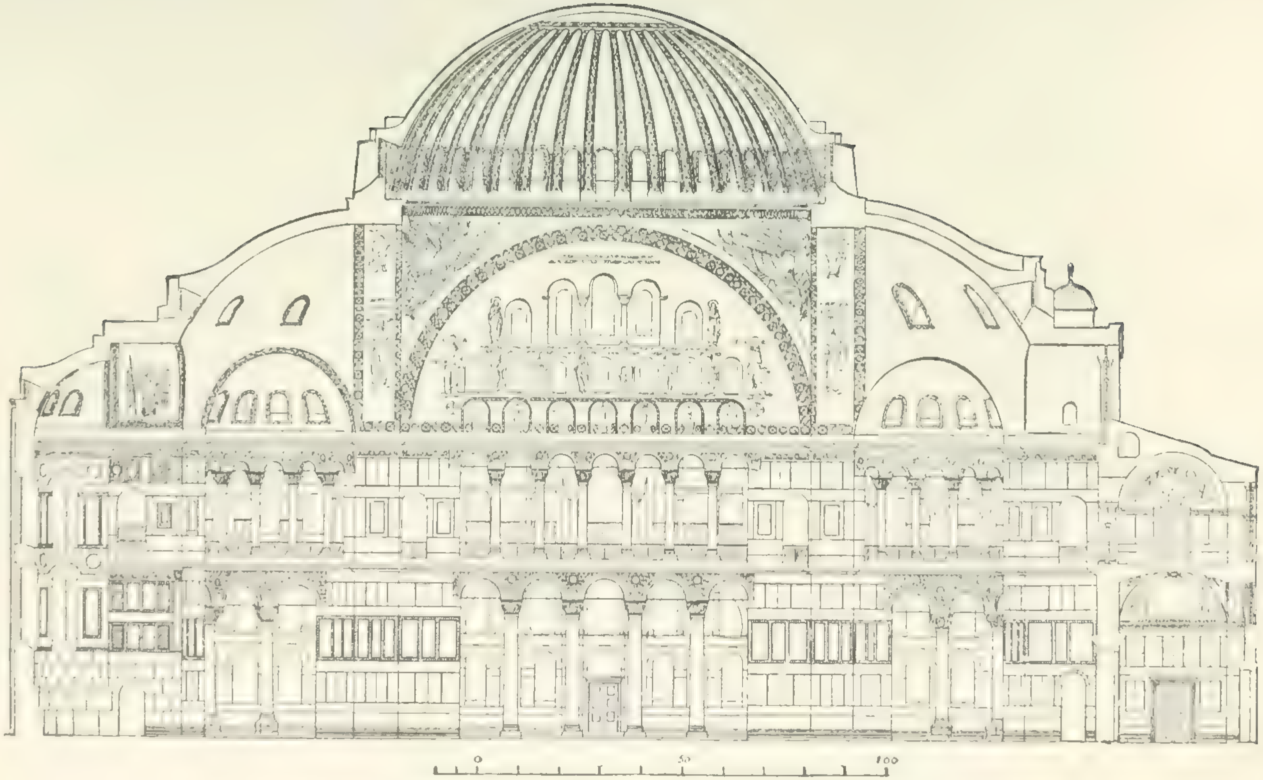
Buttress Pier: Chapter House, Lincoln, c. 1270.

tecture of the Byzantine Empire, even in its European provinces of Thrace and Macedon; and their art was profoundly influenced by traditions handed down from Assyria and Persia, and by familiarity with the silks and other fabrics of India and China and the rugs for which Western Asia and Persia have always been famed. These combined influences, operating upon the groundwork of Roman structural traditions, produced a gradual change of style, which may be traced in the later pagan Roman buildings of Syria; in the palace of Diocletian at Salona, where now the little town of Spalato has been built upon its ruins; in the early Christian buildings of Syria of the fourth and fifth centuries, and in much of the work of Constantine's reign alike in Rome and the East; and which culminated in the sixth century in a number of remarkable buildings erected by Justinian at Constantinople, Ravenna, Jerusalem, and elsewhere. These buildings were never surpassed, nor indeed equalled, by the later productions of the style, which were chiefly churches of small size, richly decorated internally with mosaics or frescoes, but lacking scale and structural dignity.



Byzantine Architecture: Church of S. Sophia (Plan) at Constantinople, as Rebuilt, 538 and 558.

Characteristics. Structurally, Byzantine architecture differs from all earlier styles in its universal and exclusive use of vaulted roofs. Timber was wholly rejected, and with it the basilican plan for churches, which necessitated a roof of wood over the broad nave. The vaults employed were extremely varied, both in form and construction. They were for the most part laid up in brick, without centrings, by simple and ingenious processes derived from Assyrian traditions, and still practised to-day in Asia Minor and Persia. Groined and domical vaults predominated, the latter being by far the most prevalent, — they became, indeed, the most striking feature of the style, which might well be called the Eastern domical style. While the Roman system of building in concrete with revetments of brick and marble was exchanged for a more scientific construction of brick alone, or of brick and rubble in alternate courses, resulting in a notable reduction of the areas of the supporting masses, the structural scheme of Byzantine designs remained essentially Roman, and nearly every feature except the pendentive can be traced to examples in the Roman thermæ. This is true not only of the massive piers and buttresses sustaining the heavy vaults, of the Byzantine predilection for circular halls and semicircular apses, of the arrangement of narthex and atrium in front of the church, and of the great semicircular clerestory windows over the side aisles, but also of the decorative system of incrustation of the walls with a veneering of coloured marbles, of the use of polished monolithic shafts of semiprecious material, of the decoration of pavements with *opus sectile*, and of the adornment of vaults and lunettes with glass mosaic. Every one of these features was derived from the thermæ. On the other hand, we note in Byzantine architecture for the first time the germs of the Gothic principle of balancing thrusts by counter thrusts, instead of by dead weight as in the thermæ, and observe that the column was reconverted into a supporting member by being made to carry arches instead of fictitious entablatures. The capitals were modified in view of this new function, being formed like inverted truncated pyramids, and covered with flat, incised carving instead of strongly projecting leaves and volutes. An impost block above the capital recalled the fragment of entablature universally used in a like position in the thermæ wherever a column was made to receive the springing of a vault. The decorative system of the Byzantine style was as characteristic as its methods of con-



BYZANTINE ARCHITECTURE. CHURCH OF S. SOPHIA. (SECTION.)

(See plan.)

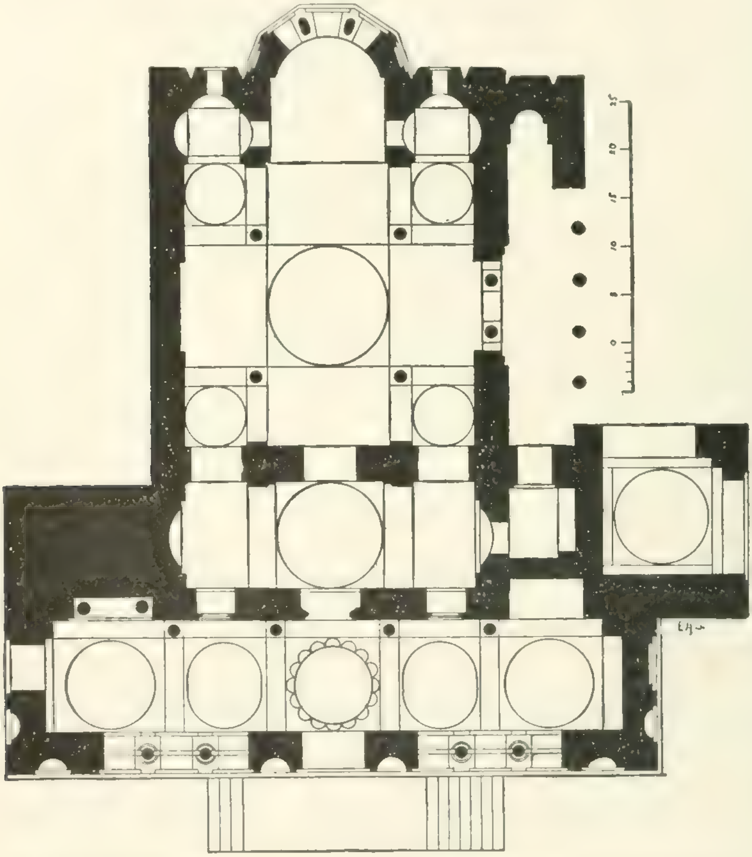
struction. Founded on the Roman practice of interior decoration with marble veneering and mosaic, — a system originally brought to Rome from Asia, — it was by the Byzantines developed to the utmost pitch of splendour, but with almost total disregard of external adornment. To the Asiatic love of colour, and taste in its decorative use, we must in part ascribe the success of this element of Byzantine design. Floors were paved with coloured marble, forming panels of geometric forms framed in bands set with minute patterns in bright colours; the walls were incrusted with richly veined slabs of marble and alabaster, arranged to produce a definite and sumptuous colour effect; and the smooth concave surfaces of the vaults were covered with mosaic, on a ground of deep lapis-lazuli blue, pale green, or more often brilliant gold (see Mosaic). This mosaic was executed with minute *tesseræ* of glass of different colours, in which green, red, blue, and gold predominated. The larger areas were adorned with pictures of saints, apostles, royal personages, Christ and the Virgin, and with emblematic subjects; the minor surfaces with conventional patterns, crosses, and monograms. The effect of the gold background was to bring into harmony the whole mass of varied colour of the mosaics, marble, porphyry, and verd antique. In the later and smaller churches fresco painting replaced the more costly mosaic.

There was no carving in high relief, and mouldings and cornices played little part in the decoration. But certain restricted surfaces, such as spandrils and soffits, were covered with a frosting or lacework of incised carving. The background was formed by a series of minute depressions, leaving the pattern in a low and uniform flat relief which produced rather the effect of inlay than of true relief. The motives of this carving were interlacing bands, flat acanthus leaves with pointed and channelled lobes, crosses, and emblems. Parapet panels or railings were often of perforated marble in intricate patterns. All this rich and elaborate interior decoration in colour required abundant light, and progress in glassmaking enabled the architect to multiply and enlarge his openings. Even the bases of the domes were pierced with a circuit or crown of windows almost detaching the cupolas, seemingly, from their supports. Between these windows externally were buttresses, in which we discern the germ of one of the most important principles of Gothic constructions; one which may, however, be traced still farther back to Rome (Temple of Minerva Medica, Tomb of Helena, as shown complete in an ancient engraving reproduced by Lanciani, etc.). But the decline of the empire began too early, and Byzantine civilization was too lacking in energy, to develop or perfect these principles.

Plans. The dominant feature of Byzantine planning and construction was the dome. Byzantine plans may be divided into two general classes: those in which the dome rests on an octagonal or circular substructure in the centre of a square or octagonal circuit wall; and those in which the dome is carried by four piers and arches, by means of spherical pendentives, over the square central part of an oblong nave flanked by side aisles enclosed within a rectangular or cruciform plan. Subsidiary domes or half domes covered the ends of the nave in the second type; and the side aisles or enclosing aisles in both types were vaulted, usually with groined vaulting, the central dome rising above these vaults and dominating the whole mass. An apse invariably projected from the eastern end, to accommodate the *bema*, or platform for the clergy, the altar, and the ciborium; it was divided from the nave in front by a screen, the *iconostasis.* The *ambon*, or pulpit, stood in front of this. In later churches, owing to changes of ritual, a minor apse also terminated the eastern end of each side aisle. A narthex or vestibule extended across the western front, preceded usually by a cloistered court or atrium.

History. The beginnings of Byzantine architecture date from the age of Constantine, *i.e.*, the early fourth century A.D. This period, usually considered as an age of decline, was really one of transition; marked, it is true, by a decline in purity of detail and an almost complete disappearance of the sculptor's art in its higher manifestations, but distinguished by unusual boldness and novelty of conception and construction. The legalization of Christianity gave a tremendous impulse to Christian architecture, but its point of departure was the accepted Roman types of the basilica and thermæ, the temples being ill suited to the needs of the Christian ritual. Western Christendom adopted the basilica type outright for its halls of worship (see Basilica), and the rotunda for its mausolea and baptisteries (see Baptistery; Round Church), baptism being regarded as a symbolic burial of the old man with his sinful works. Constantine erected basilicas, tombs, and baptisteries in Rome, Constantinople, and Syria; his predilection for the circular form is evidenced by his "Golden Temple" at Antioch, and the east end of his church of the Holy Sepulchre at Jerusalem, as well as by the tombs of Constantia (church of S. Costanza) and of Helena (Torre delle Pignatte) at Rome. These round structures were based on the design of the Pantheon, with seven deep internal niches hollowed in the mass of the heavy wall, the whole covered by a dome. An example of this type is seen in S. George at Salonica, dating chiefly from the fifth century. In Syria the niches on the diagonal axes were enlarged to fill the corners of a plan externally square, and the dome made octagonal (S. George at Ezra, fifth or early sixth century); or the dome was erected on eight or more isolated supports within a larger exterior circuit (Bosrah, sixth century; both in the Hauran, Syria). Meanwhile the use of flat surface carving, basket capitals, impost blocks, and arches carried on columns had been developing in the Roman provinces (Spalato, Palmyra, Baalbec, Central Syria), and in Ravenna; and Oriental artists employed in Rome, Ravenna, Antioch, and Constantinople had been perfecting the art of glass mosaic. Early in the sixth century the church of S. Sergius was built in Constantinople, with a dome carried on eight piers and arches, the central space enlarged by four apses on the diagonal axes, besides the chief apse at the eastern end, and the whole surrounded by an aisle within a square enclosure. A few years later this design was imitated with variations in S. Vitale at Ravenna, an apse or niche opening into each of the six lateral arches, the surrounding enclosure being octagonal; a type apparently influenced by the so-called Temple of Minerva Medica at Rome, and again repeated in the minster at Aix (about 809 A.D.) and later at Fulda, Essen, and Ottmarsheim (1050). When, upon the burning of Constantine's basilica of the Divine Wisdom (Hagia Sophia) at Constantinople, Justinian in 532 summoned Anthemius and Isodorus from Asia Minor to build a new church of surpassing magnificence, Anthemius conceived the brilliant idea of combining in one edifice the basilican type with its nave and side aisles, and the rotunda as developed in S. Sergius. But the basilica he imitated was that of Constantine or Maxentius at Rome, — a vaulted hall in three bays, with broad side aisles divided each into three compartments by the transverse buttresses which stayed the nave vaults. This combination he accomplished by substituting for the terminal bays of Constantine's basilica the east and west halves of the plan of S. Sergius, and erecting over the central bay, 107 feet wide, not a groined vault, but a large dome on pendentives. This daring conception was carried out in six years, and embellished internally with the utmost splendour of marble and mosaic (see Church of S. Sophia under Church). The dome on pendentives (*i.e.*, supported on four arches bounding a square, by means of concave triangular spherical surfaces filling up the spaces comprised between the base of the dome and each pair of adjacent half arches) was not absolutely a new invention; but it had previously been used only on a small scale, and in a fragmentary and tentative way which failed to recognize adequately either the structural or geometrical principles involved. Anthemius absolutely mastered these at a stroke, and applied them on a vast scale in so triumphant a manner, that the dome on pendentives was ever after as characteristic of Byzantine architecture as the ribbed vault of the Gothic. (See Pendentive.)

At this time Constantinople was at the zenith of her wealth and glory, and under Justinian a most extraordinary architectural activity set in. The whole Roman world was ransacked for building materials and pagan temples rifled of their marble and porphyry, to adorn Justinian's architectural enterprises at Constantinople, Ravenna, Salonica, Jerusalem, and elsewhere. Next to Hagia Sophia, the most important of his works was the church of the Holy Apostles at Constantinople. This church, destroyed by the Turks in 1453, was the prototype of S. Mark's at Venice, erected in 1047 largely by Oriental architects. Its plan was cruciform, with a nave in three bays covered by three domes on pendentives, the central dome higher than the others and pierced with windows at its base; and square transept arms, each covered by a dome. S. Sergius and Hagia Sophia at Constantinople, and S. Vitale at Ravenna are the only important churches of Justinian's time remaining substantially unchanged in form to our day. Many others, erroneously attributed to him, are of later date (*e.g.*, S. Sophia at Salonica), and others, again, like S. Irene at Constantinople (Hagia Eirené = the Divine Peace), though built or rebuilt under him, have been greatly altered by later rulers. It is a remarkable fact that not one Byzantine church of which we have any knowledge reproduces with any closeness the plan of Hagia Sophia, while that of the Holy Apostles has been preserved to us only in S. Mark's at Venice and in S. Front at Périgueux (twelfth century). This is partly due to the artistic paralysis which seems to have affected the empire after the seventh century, with the decay of its political and military prestige; partly to changes in the ritual, calling for changes in the plan and details of the churches. For the most part, the churches are of small size. In Greece and in the Danubian provinces, indeed, they were often mere chapels of microscopic dimensions, — the cathedral of Athens measures 37 by 32 feet. The plans of the later churches are very varied, but in most cases a single central dome on pendentives forms the nucleus of the design. An apse (sometimes three) terminates the church eastward, side aisles flank the nave, and a narthex extends across the western front. In some plans there are only four columns, in others a larger number, carrying the vaulting of the side aisles and front part of the church; in many examples minor domes cover the small square bays between the arms of the wider nave and transepts (*e.g.*, Theotokos at Constantinople); barrel vaults are combined with groined vaults and low domes to produce a varied interior perspective, which, if carried out on a larger scale, would be very effective; the narthex was often doubled, with a gallery over the inner vestibule, to serve as a Gynæceum (which see). In Servia, lateral apses, as well as an eastern apse, open

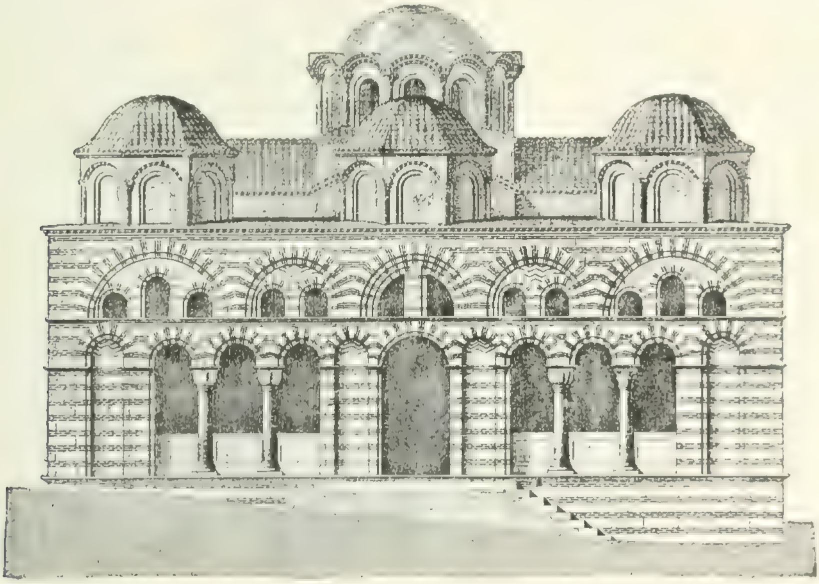


Byzantine Architecture: Church of the Theotokos (A, Plan), Constantinople; 10th Century.

out from the central space in some examples (Ravanitza, Krusevatz, cir. 1390); the same is seen in the beautiful church at Kurté d'Arjish in Roumania (1529). At Trebizond is a church with three eastern apses and two large transeptal halls or porches. The church called Pantokrator at Constantinople (Zeirek Djami) originally consisted of two shrines combined with the mausoleum of Irene, the empress of John Comnenus (cir. 1160). These and other almost countless variations indicate the weakness of the style in the absence of any controlling type or principle of planning, and offer a striking contrast to the unity and harmonious development of type in the Constantinople mosques which the Turkish conquerors later erected, based on Hagia Sophia, and working out under new conditions the suggestions it offered for Moslem halls of worship (see Moslem Architecture and Mosque). The one feature which most conspicuously marks the style of the later Byzantine churches is the high drum of the dome. In the remodelling of S. Irene at Constantinople, under Leo the Isaurian, the crown of windows separated by buttresses, at the base of the dome, was given a greatly increased height; and in the churches of the tenth and later centuries this feature took the proportions of a high drum, — an artistic necessity, perhaps, with the tiny domes of small churches, both to give dignity and to admit sufficient light to the interior. Throughout Greece it was also customary to place external wall shafts between these windows, and to allow their arches to penetrate the curve of the dome externally as well as internally. Some of the chief of these later churches are: at Constantinople, the Moné tes Choras (Kahiré Djami), of the eleventh century, rebuilt in the thirteenth by Theodore the Metochite, and celebrated for the beautiful mosaics of its narthex (much injured in the earthquake of 1894); the Theotokos (Mefa Djami) of the same period, with elaborate façade in brick and stone; the Pantokrator (Zeirek Djami), 1150; the Pantepopta (Eski Imaret Djami). At Salonica, Hagia Sophia, Holy Apostles, S. Bardias, and S. Elias; at Trebizond, Hagia Sophia and cathedral (thirteenth and fourteenth centuries). In Greece, at Athens, many small churches (Katholikon, Kapikareia, Lykodemou, etc.); many conventual churches (Daphnis, Mount Athos, Misitra); in Danubian Provinces, at Studenitza, Ravanitza, Krusevatz, Semendria, Kurté d'Arjish, etc.; many others in Asia Minor (Angora, Cassaba, Myra, Trabala) and Armenia (Ani, Etchmiadzin, Dighour, Pitzounda, etc.). The churches in Armenia form an interesting class apart, not so much in plan as in external treatment. They are constructed chiefly of stone, with domes forming externally conical stone roofs, and with a picturesqueness of mass and a harmony and wealth of exterior ornament in striking contrast with the prevailing poverty of external design elsewhere. The relation of the intricate interlaces at Kouthais, Tourtoun, and some other places to Celtic ornament is not easy to determine, though the resemblance is striking.

In Russia the Byzantine style has been identified with the national church, except where a more or less debased Western classic style founded on Italian examples has taken or disputed its place; but it has been so overlaid with local eccentricities of design as to be hardly recognizable. High turrets, twisted and bulbous spires, the external use of gilded copper and brilliantly coloured tiles, and a general absence of architectonic propriety or restraint in plan or detail characterize the Russian branch of the style.

In Italy the early beginnings of Byzantine art are seen at Ravenna, in the tomb of Galla Placidia and the beautiful baptistery called Battisterio degl' Ortodossi, both rich in mosaics and dating from the early fifth century, in the decorations of the basilicas of S. Apollinare Nuovo, S. Apollinare in Classe, and others, and in the archbishop's chapel; also in the circular or polygonal baptisteries of Asti, Florence, Nocera dei Pagani, Novara, etc. The church of S. Vitale has already been alluded to. The reflex influence of the fully developed style was especially strong in Venice, where in the twelfth century was erected in its present form, upon earlier foundations, the superb church of S. Mark, modelled after the church of the Holy Apostles in Constantinople. (See Church of S. Mark under Church.) This edifice, with five domes over its nave and transepts, and a magnificent narthex and west front added later, was adorned with a wealth of colour in permanent and precious materials and mosaic, such as to equal or surpass its original, and to justify the verdict that "there have been no such colourists in architecture as the Venetians" (C. E. Norton).



Byzantine Architecture: Church of the Theotokos (*B*, Elevation; see *A*, Plan).

The west front, incoherent and illogical as it is in some respects, is yet, on account of its picturesqueness and magnificence, without a counterpart in Byzantine architecture, and one of the most beautiful façades to be seen anywhere. The external use of marble veneering and of mosaic was a Venetian innovation; it is seen in the recently restored Fondaco dei Turchi (Museo Civico) dating from the twelfth century; and the practice lasted into the Renaissance. The whole of Venetia is full of vestiges of Byzantine carving and detail, and the church of S. Fosca at Torcello is thoroughly Byzantine in general design. In Sicily, under the Normans in the twelfth century, a number of churches were built which betray a picturesque mingling of Byzantine and Moslem influences (cathedral at Monreale, Capella Palatina and Martorana at Palermo, etc.); while in the north the church of S. Lorenzo at Milan, rebuilt in the sixteenth century on the old foundations, is by many considered to have been originally erected in the sixth century under the influence of the newly built Hagia Sophia at Constantinople. Along the pathway of Venetian and Oriental commerce in France the Byzantine influence gave rise to a series of remarkable domical churches in Aquitania, chief of which is S. Front at Périgueux, and the influence of the style is also traceable in much of the carving of the Romanesque period, not only in Italy, but also in France and Germany, and even in England. How far it was concerned in the development of Celtic and Scandinavian ornament is a question not yet settled.

Few of the secular monuments of Byzantine architecture have been spared to our day, though the palaces of the Byzantine emperors were undoubtedly magnificent. A facade in Ravenna supposed by many to be a part of the palace of Theodoric, though probably of later date, the banquet hall of the Blachernæ palace at Constantinople, and the great underground cisterns of that city, constitute the list.

No complete history of Byzantine architecture has yet been written, owing perhaps to the lack or inaccessibility of original documents; but the literature of the subject is nevertheless fairly abundant. Besides notices in general histories and handbooks, the following may be consulted: Achison, *Byzantine Architecture* in *Architectural Record* for 1892 and 1893 (N. Y.); Bayet, *L'Art Byzantin;* Choisy, *L'Art de bâtir chez les Byzantins;* Couchaud, *Églises Byzantines en Grèce;* Essenwein, *Ausgänge der Classischen Baukunst* (being Part II., Vol. III. of the Darmstadt *Handbuch der Architektur*); Gosset, *Les Coupoles d'Orient et d'Occident;* Hubsch, *Monuments de l'Architecture Chrétienne;* Isabelle, *Les Édifices circulaires;* Kanitz, *Byzantinische Monumente in Serbien;* Lethaby and Swainson, *S. Sophia, Constantinople;* Ongania, *Basilica di S. Marco;* Pulgher, *Les Églises Byzantines de Constantinople;* Von Quast, *Die Altchristliche Bauwerke zu Ravenna;* Salzenberg, *Altchristliche Baudenkmale von Constantinopel;* Texier, *L'Arménie et la Perse;* Texier and Pullan, *L'Architecture Byzantine;* De Verneilh, *L'Architecture Byzantine en France;* De Vogüé, *Églises de la Terre Sainte;* Hamlin, *History of Architecture,* Chapter XI.; Fergusson, *History of Architecture,* edition 1893.

— A. D. F. HAMLIN.

C

CA'. The Venetian abbreviation of the word *casa* (house). In this sense it is used as a part of a common title of many dwelling houses, including some important structures, each of which would be called *Palazzo* in other Italian cities. (See Ca' Dario; Ca' d'Oro; Ca' Foscari.)

CABANEL, RUDOLPH; architect; b. 1762 (at Aix la Chapelle), d. Feb. 4, 1839.

Cabanel settled in London early in life, and devoted himself to the construction of theatres. He arranged the stage of the old Drury Lane Theatre (London), and designed the Royal Circus Theatre, afterward called the Surrey (1806), and the Coburg (later Victoria) Theatre. Cabanel designed a form of roof, which goes by his name, and various mechanical contrivances.

Redgrave, *Dictionary of Artists.*

CABIN. *A.* A residence smaller and more humble than a cottage. In the United States hardly used, except for the houses of slaves on a plantation before 1865, though in some cases continued in use since the abolition of slavery. Such cabins generally had a living room of fair size, with a fireplace, the chimney being outside the wooden and framed wall, and at least one other small room, sometimes in a shed or lean-to. The house was generally raised on four or six posts, so as to have no continuous foundation and no cellar. (See Quarters, *C.*)

B. A room or saloon in a ship or steamer, — as the captain's cabin, the second-class cabin.

CABINET. *A.* A small cabin, hut, or shelter (obs.); hence, —

B. A comparatively small room, especially one used by a sovereign or high official for private conferences or interviews.

C. A small closet or piece of furniture provided with shelves, cupboards, or the like, frequently a rich and ornamented piece of furniture of such a character, designed primarily for the safe keeping of valuable articles; hence, —

D. A building or part of a building used as in definition *C.* This usage has become obsolete, but its significance is still seen in *cabinet picture,* and in the use of the term as signifying a collection of curiosities or works of art.

CABINETMAKING. The art and the trade of making fine woodwork, whether for furniture (to which the term was formerly confined) or for the interior finish of houses, ships, and offices. It is distinguished from the rougher and less elaborate carpenter work by the careful and accurate fitting and high finish which it involves, by the lightness and relatively small scale of its productions, and by its predominant use of fine and hard woods. In carpentry the pieces used are relatively large, and secured by nailing in the majority of cases, while the exterior finish is commonly painted. In cabinetmaking the pieces are small, glue enters largely into the joining of parts, and fine varnishing and polishing are required for the finish.

CABINET WINDOW. A kind of projecting window or bay window for the display of goods in shops, much used early in the nineteenth century, and occasionally imitated in mansions and villas.

CABLE. *A.* Same as Cable Moulding (which see, under Moulding).

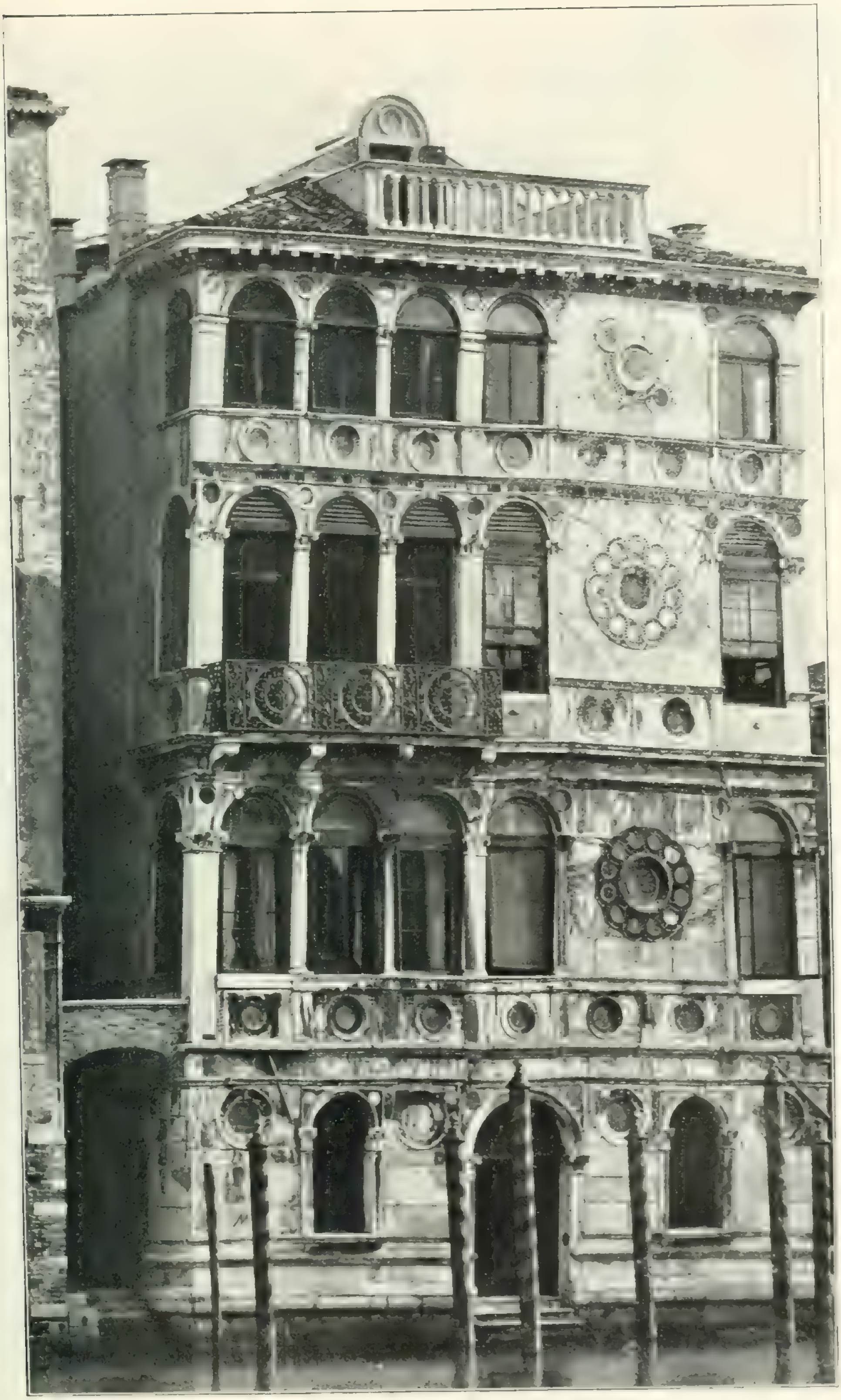
B. A moulding of convex section formed in the flute of a column. (Compare Reeding.) It is usual to fill only the lower part of the flute with these cables, — that is, for the lower half, or less than half, of the shaft.

CABLE FLUTED. Having each fluting filled with a Cable, *B.* Said of a column, or more rarely of a pilaster.

CABLING. *A.* Cable mouldings collectively. Decoration by Cable Mouldings.

B. Same as Cable, *B.*

CA' DARIO. In Venice, on the Canal Grande; built about the middle of the fifteenth century. Exquisite Renaissance style, with inlaid and richly veined marbles.



CA' DARIO

In Venice, a house of the earlier Renaissance adorned with slabs of richly veined marble, each one formed with carved white marble. Its date is about 1475. For many years the floors have been out of level, the northwestern [illegible] having sunk, but it is perfectly habitable.

CA' D' ORO. In Venice. A late Gothic palace built at the beginning of the fourteenth century. Only a part of the front remains. It was restored in a ruinous way at the beginning of the present century, and the splendid interior staircase destroyed. (See Bono, Giovanni.)

CAEN STONE. A soft, fine-grained, light-coloured, Jurassic limestone from near Caen in Normandy. One of the most noted limestones of modern history.

CAFÉ. In French, a room, as in a hotel, or separately rented as a shop, accessible from the street, and used for the sale, for consumption on the spot, of coffee, chocolate, etc.; also of brandy and different *liqueurs* which are commonly taken with or after black coffee; also of *groseille* (currant syrup) and similar non-intoxicating drinks; also, in larger establishments, of wine and certain dishes. The distinction is generally maintained between the café and the restaurant, but some very famous restaurants, as in Paris, have retained the name of café with a qualifying term. In America, especially in the modern hotel, the words "bar" and "barroom" are apt to be ignored, and "café" substituted.

CA' FOSCARI. In Venice, on the Canal Grande. It is of the finest thirteenth and fourteenth century Gothic, with the most perfectly proportioned arcades for the great groups of windows.

CAGE. A chamber or enclosure formed wholly or partly of bars, slats, wire, open work, or tracery, as for wild beasts in a zoological garden; especially, —

A. A chantry or chapel screened by open tracery.

B. Timber framework to line a shaft or working in a mine.

C. The iron and steel skeleton used in high modern buildings, — called steel cage, although many of its parts are of wrought iron or cast iron. (See Iron and Steel Construction; Skeleton.)

CAHER; CAHIR. In Celtic archæology a fort, the term being applied to the ruined stone structures which have the appearance of being intended for defence. The word is more commonly used in composition as forming part of a proper name; thus Caher-gal is at Lough Corrib in Ireland.

CAILHON, JEAN; architect.

Cailhon was called from Paris in 1629 to continue the façade of the cathedral of Auch (Gers, France) begun by Jean de Beaujeu (see Beaujeu), and carried the structure from the springing of the arches to the entablature of the great Corinthian order.

Caneto, *Sainte-Marie d'Auch*; Bauchal, *Dictionnaire.*

CAILLETEAU (called **L'ASSURANCE**), architect; d. 1723.

Cailleteau began as a draftsman, employed by Jules Hardouin Mansart. He was associated with Girardini (see Girardini) in the earlier constructions of the Palais Bourbon (begun 1722), and with Aubert at the Hôtel de Lassay. Both buildings are now included in the Palais de la Chambre des Députés (Paris). He made the first plans for the Hôtel d'Evreux, now Palais de l'Élysée (Paris).

Lucas, *Cailleteau*, in *La Grande Encyclopédie*; Dély, *La restauration de la Chambre des Députés*; Bauchal, *Dictionnaire.*

CAILLETEAU (called **L'ASSURANCE**), **JEAN**; architect; d. 1755.

A son of Cailleteau the elder (see Cailleteau). In 1715 he went to Rome to study. In 1724 he succeeded his father as *contrôleur* at the château of Marly, France. Between 1748 and 1750 he made extensive additions to the châteaux of Crécy, Saint-Cloud, and Aulnay for Madame de Pompadour. For her also he built the château of Bellevue in 1751. In 1749 he was appointed *contrôleur* of the buildings at Fontainebleau. He continued his father's work at the Hôtel d'Evreux (now Palais de l'Elysée).

Charles Lucas, *Cailleteau*, in *La Grande Encyclopédie*; Bauchal, *Dictionnaire*; Lance, *Dictionnaire.*

CAIRENE ARCHITECTURE. The architecture of Cairo in Egypt, especially the architecture of Saracenic or, more properly speaking, Moslem style. The mosques of Cairo contain the richest ornamentation of the unaltered style invented for the Arabian conquerors by the Byzantine Greeks who worked under their direction, which style was much corrupted in North Africa and in Spain. This Cairene architecture has, then, the peculiar value of having preserved for us the best examples of this curious school of design, and the richest and most tasteful pieces of its ornamentation. (See Moslem Architecture, and the references under that head.)

CAIRN. A tumulus of stones, whether chambered or solid, usually of a sepulchral or commemorative character. In the essential character the Egyptian pyramid was a cairn. In modern times, sepulchral monuments have been made in the form of very rough pyramids, having usually a tablet with an inscription.

CAISSON (I.). *A.* As used for building upon pile foundations or other firm bottom under water, a water-tight box in which the masonry is built, and is then lowered into its place. The floor is made strong enough to carry the weight of the masonry, the sides are detachable, and are taken off when the caisson rests upon the bottom. The caisson is sometimes made large enough to be buoyant with its load of masonry, and is sunk by letting in water, is sometimes lowered by chains from a fixed platform, but usually it is floated into position and sinks as the masonry is built in it.

B. Generally with the qualifying term pneumatic or compressed air — a device for sink-foundations under water or in soil containing much water, or too soft to be supported by other means. It is in form an air-tight box the size of the pier to be built upon it; the bottom is open, the top is strongly floored to carry the weight of the masonry. It is sometimes framed of wood, but for architectural building it is generally made of steel plates and beams. Entrance and exit are by means of an air lock; materials are generally supplied through a separate air lock. In use, the caisson is loaded sufficiently to overcome the friction of the earth on its sides, and the lifting power of the compressed air within it. This loading is usually the masonry which it is to support. The air is introduced under a pressure sufficient to exclude or expel the water or fluid earth entering under the lower edge. The earth in the centre and under the edges is excavated by men working in the compressed air, and is lifted out in buckets through an air lock, or blown out through special pipes by compressed air or by a water jet. As weight is added above, and the supporting earth beneath is removed by excavation aided at times by reducing the air pressure, the caisson gradually sinks until the lower or cutting edge rests upon the rock or other surface upon which it is to remain. It is then filled solid with concrete, and the air locks are removed for use elsewhere. The masonry upon it has meantime been carried above water, so as to be accessible when the caisson has come to rest. The air pressure is generally taken at half a pound to the square inch for every foot in depth of water, although this is in excess of their actual relation. (See Foundation.)

W. R. Hutton.

CAISSON (II.). In Roman imperial and neoclassic architecture, a sunken panel, especially in a vaulted ceiling or the inside of a cupola. Caissons are generally square or octagonal, the octagon not being always regular. Some caissons have the different sides uniformly moulded or otherwise ornamented; but in many cases the mouldings are modified so as to be seen properly from below. Thus, the lowermost side of a square caisson will have the mouldings forming a more oblique angle with the surface of the vault than those of the other side. (See Lacunar.)

CAJON. A kind of Pisé used in Spain and also in France and some parts of England. In France, the wall is formed by ramming the earth into a box; the latter is about 3 metres long, 1 metre high, and 50 to 60 centimetres wide. (See Pisé.)

CAKCHIQUEL ARCHITECTURE. (See Central America, Architecture of; Maya Architecture; Mexico, Architecture of, Part I.)

CALABOOSE. A common jail or lockup. (Local in the United States.)

CALAMIS (KALAMIS) OF ATHENS; sculptor.

Calamis was a Greek sculptor of the first half of the fifth century B.C. His work is known only by the description of classic authors. It was undoubtedly archaic in style and characterized by great refinement. The base of a statue of Aphrodite by Calamis has been found on the Acropolis at Athens. This Aphrodite was undoubtedly identical with the Sosandra so highly praised by Lucian (op. cit., *Portraits; Courtesan*).

Collignon, *Histoire de la sculpture grecque*; Lucian, *Dialogues*.

CALATHUS. Primarily a flower basket having a flaring or bell-shaped form; hence, as used by some ancient writers, Vitruvius among them, the bell or core of the Corinthian capital and of some other Greek and Egyptian campaniform capitals.

CALCAIRE GROSSIÈRE. A highly fossiliferous Tertiary limestone occurring in the so-called Paris Basin, of France, and much used for building purposes in and about Paris.

CALCIMINE. Same as Kalsomine.

CALDARIUM. In Roman thermæ, the warm bath; and, by extension, the room in which the warm baths were situated. (See Thermæ.)

CALEFACTORY. *A.* An artificially heated room in a monastery.

B. A metallic vessel containing hot water or live coals, placed on the altar in a church for the priest to warm his hands upon.

CALENDARIO, FILIPPO; sculptor and architect; d. 1355.

Calendario appears to have been a shipbuilder of Murano who became *capomaestro* of the Doges' palace in Venice and chief architect of the Venetian Senate. He is supposed by Perkins to have made the capitals of the façade of the palace under the influence of Andrea da Pisa (see Andrea da Pisa). He also continued (1327) the reconstruction of the arsenal at Venice supposed to have been begun by Andrea da Pisa. In 1355 he was hung as a conspirator from the "red columns" of the Doges' palace.

Paoletti, *Rinascimento in Venezia*, Vol. I., p. 10 (1893); C. C. Perkins, *Italian Sculptors*.

CALIARI, PAOLO. (See Veronese.)

CALIDUCT. A hot air flue. In the ancient Roman systems of furnace heating, the caliducts were terra cotta flues, or were built up with brick partitions and tile facings. In modern work the flues are usually of bright tin or galvanized iron. (See Furnace; Warming.)

CALKING. (See Caulking.)

CALLAESCHRUS (Kallaeschros). (See Antistates.)

CALLE. In Italian, a street; especially in Venice, where the streets, having no carriage way and being paved from house to house with smooth blocks of stone, have no need of width and are what would be called in English alleys.

The few wider thoroughfares in Venice take different names, as *Via*, and, on the water-fronts, *Fondamenta*, *Riva*. (See also Rio Terrà.)

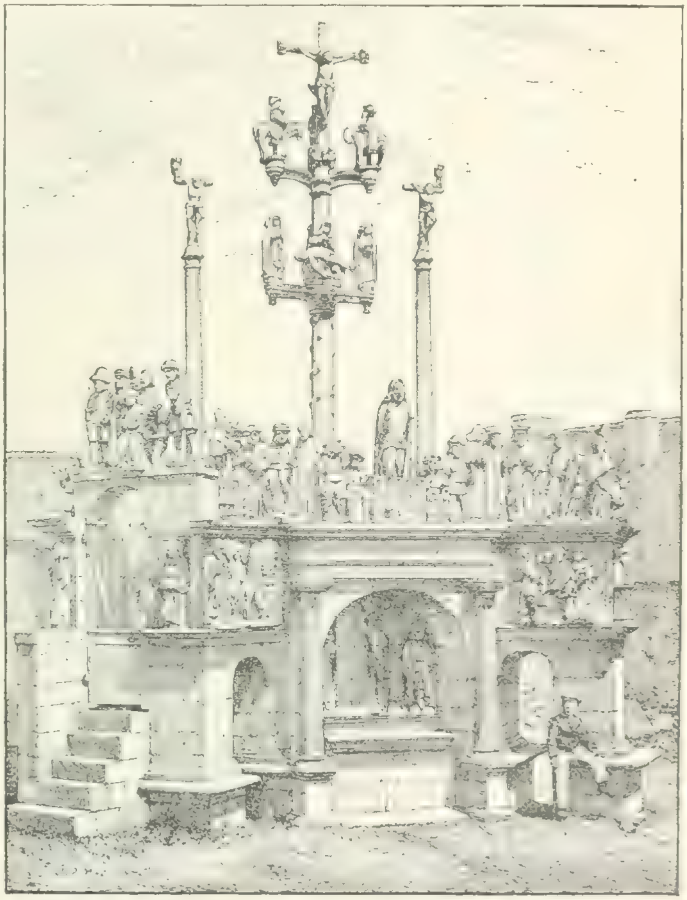
CALLET, FÉLIX EMMANUEL. (See Callet Père.)

CALLET "PÈRE"; architect; b. March 10, 1755 (at Paris); d. about 1850.

He filled the office of *commissaire voyer* of the city of Paris from 1796 to 1828, and formed a remarkable collection of works on French architects and architecture. This included the famous series of the works of Jacques (I.) Androuet du Cerceau (see Androuet du Cerceau, J., I.), which was sold to the city of Paris and destroyed with the Hôtel de Ville in 1871. He is best known by his *Notice historique sur la vie artistique et les œuvres de quelques architectes français*. His son, Félix Emmanuel Callet, assisted Victor Baltard (see Baltard, V.) in the construction of the *Halles Centrales* (Paris).

Ch. Lucas in *La Grande Encyclopédie*; Lance, *Dictionnaire*; Callet, *Notice historique sur quelques architectes français*.

CALLI. In the Nahuatl, or Aztec, language of Mexico, a house. Prefixes were used to designate different kinds of houses, as Concalli, storehouse; Tezcalli, a kitchen; Teccizcalli, House of Shells; Ticplantlacalli, stone house; Teocalli, House of God (from Teotl, the Highest Being), etc. The last term is now employed as meaning the mound upon which the temple stood, as well as the sacred building itself. (See Mexico, Architecture of; Part I.; Mound.) — F. S. D.



Calvary at Plougastel, near Brest in Brittany.

CALLIAT, PIERRE VICTOR; architect; b. Sept. 1, 1801 (at Paris); d. Jan. 12, 1881.

Calliat was a pupil of Chatillon and the *École des Beaux* Arts (1823). In 1832 he won the *Prix Départemental*. Calliat restored the church of S. Gervais (Paris) in 1862. In 1850 he founded the *Encyclopédie d'Architecture* which he conducted in association with A. E. Lance. (See Lance.)

Bauchal, *Dictionnaire*.

CALLICRATES. (See Ictinus.)

CALLIMACHOS (Kallimachos); sculptor. Kallimachos was a younger contemporary of Phidias (see Phidias) who is usually associated with Calamis (see Calamis) on account of the grace and delicacy of his style. He was chiefly noted for the beauty of his decorative work. He made for the Erectheum at Athens a bronze lamp, which was kept always lighted, and a golden palm tree. Vitruvius (IV., 1, 9) credits him with the invention of the Corinthian Capital.

Brunn, *Geschichte der Griechischen Künstler*; Vitruvius, ed. Marini.

CALOTTE. In French, originally a cap or similar covering; hence a hollow, or rounded concave member; and also a covering as of metal; especially,

A. A cupola or part of a cupola, as the upper portion of a spherical vault, and, often, an inner cupola of light material.

B. A half cupola, as the head or semidome of a niche.

C. The leaden capping or sheathing of a spire or pinnacle.

CALVARY. A sculptural representation of the Saviour's passion, usually as the culmination of a series of representations of the fourteen

"Stations of the Cross," either in a church or in the open air, as in many Breton cemeteries, in the streets of some Spanish cities, and the Sacro Monte at Varallo in Piedmont. In the more important examples, the scene of the Passion crowns a steep natural hill or rock, and is reached by stairs or steep paths flanked by chapels with the scenes of the stations. Many altarpieces of the fourteenth and fifteenth centuries are carved as Calvaries, with the Stations depicted upon the walls of the side aisles.

CALVES' TONGUE. A small pointed member in relief; used with others in the Calves' Tongue Moulding. (See Moulding.)

CAMAÏEU. In French, a cameo; hence, in French and adopted into English, painting in monochrome; especially that done with the desired effect of giving a somewhat deceptive appearance of relief.

CAMARON, NICOLAS; sculptor and architect; b. 1692; d. 1767.

Camaron executed the choir stalls of the cathedral of Segorbe (Valencia, Spain) as well as the great retable of the church of the Jesuits in that city.

Bermudez, *Diccionario Historico.*

CAMBER. A slight rise or upward curve of an otherwise horizontal, or apparently horizontal, piece or structure. In a steel truss having apparently parallel, horizontal chords, the pieces composing the upper chord are usually made slightly longer between joints than the corresponding parts below; the result being a slight invisible camber, by which the tendency to sag is overcome. A so-called *flat* arch is usually built with an intrados having a camber.

CAMBER PIECE; **SLIP.** A piece of wood having its upper surface slightly curved upward; used as a centering in building flat arches so as to give the intrados a slight camber; sometimes a mere board with one edge cut to a convex arc of a very long radius, or a barrel stave.

CAMBICHE. (See Chambiges.)

CAMBODIA, ARCHITECTURE OF. (See Farther India, Architecture of.)

CAMBRAI, JEAN DE. (See Jean de Cambrai.)

CAME. Originally, the amount of lead (50 pounds) allowed for leading 100 square feet of stained glass. This was cast into slender rods which were converted into window leads by being drawn through a steel plate (called in England a "vice") having a perforation of the required I-shaped form. In time the slender rods before being thus drawn were called cames, and are still so called in Great Britain. In the United States the word is applied to the window leads after drawing, ready for use by the glazier.

CAMERLAIN, JOSEPH; architect and sculptor.

Camerlain was educated at the Academy of Antwerp and at Paris. In 1806 he went to Saint Petersburg and in 1816 was sent to Tiflis as chief architect of Georgia.

Immerzeel, *Hollandsche en Vlaamsche Kunstschilders, Beeldhouwers,* etc.

CAMERON, CHARLES; architect.

Cameron was an English architect who practised in the latter part of the eighteenth century. He published *The Baths of the Romans, explained and illustrated with the Restorations of Palladio corrected and improved* (London, 1 vol., folio 1772).

Redgrave, *Dictionary of Artists.*

CAMP. *A.* The location of a temporary habitation, especially of a large number of men.

B. By extension from the place to the shelters erected for temporary occupancy, the tents or huts taken collectively which serve a military force, a number of workmen engaged in temporary occupation in a wild country, or the like.

C. By further extension, and in a somewhat jocose or familiar sense, a single building or a principal building with its outhouses and the like, intended for temporary residence, as during the hot season, and usually rough and slightly built.

CAMPANATO, SIMONE; bronze founder.

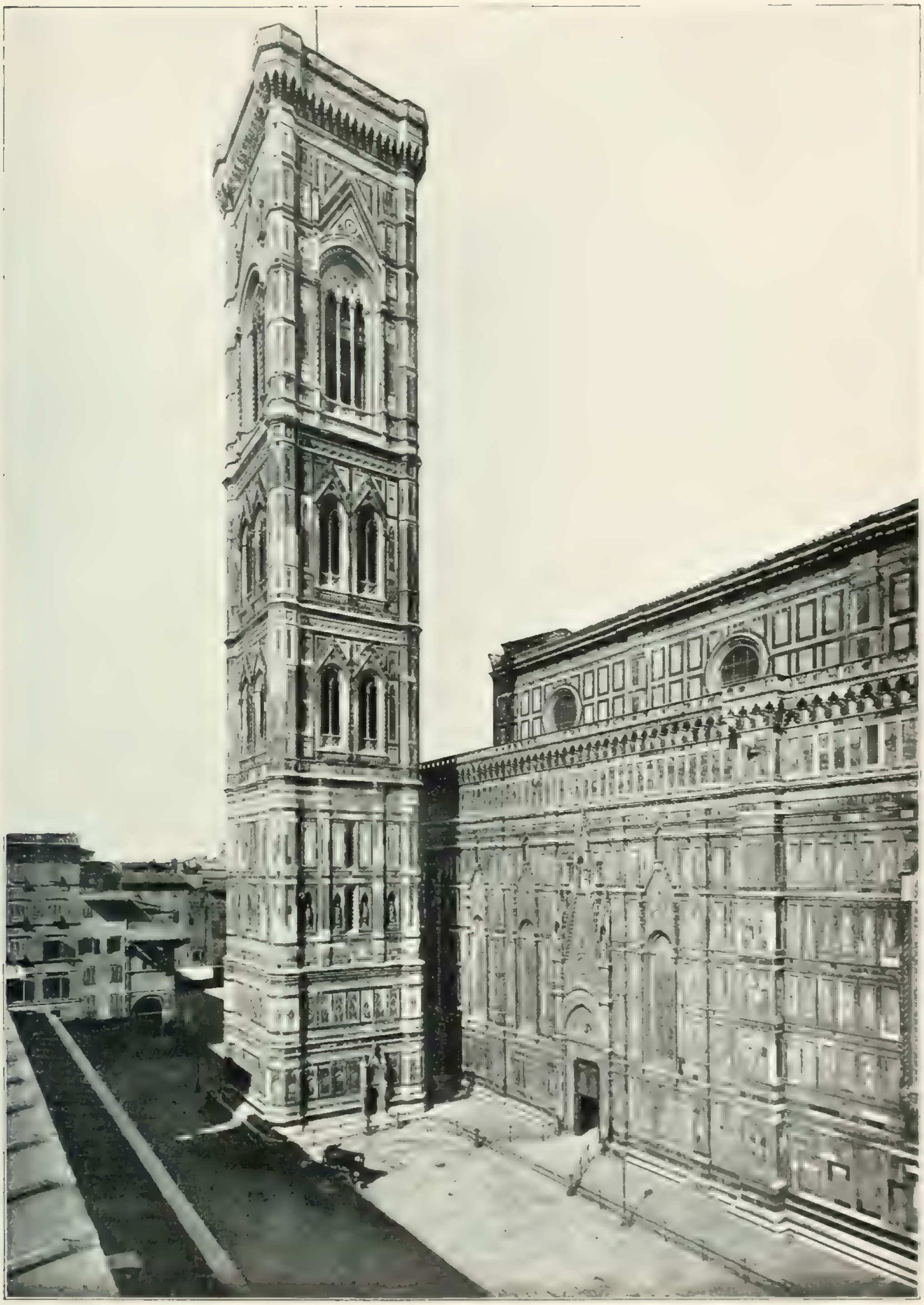
Simone Campanato cast the great bell on the clock tower (*torre dell' orologio*) of the Piazza di S. Marco in Venice, which was placed in position Dec. 1, 1497. This bell was probably designed and modelled by Alessandro Leopardi. (See Leopardi, A.)

Paoletti, *Rinascimento in Venezia.*

CAMPANILE (pl. Campanili). In Italian, a bell tower; hence, a bell tower of Italian design or general character, especially a church tower more or less completely separated from the rest of the building, and generally having no buttress nor any marked break in its outline, which is square, unbuttressed, plain, and with nearly all its decorative effect near the top in connection with the belfry chamber. Such towers are abundant in Italy during all the mediæval epoch, and their general character was preserved in the Renaissance and post-Renaissance styles. Among the largest existing are those of the cathedral of Cremona in Lombardy, of S. Mark's church in Venice, and of the Piazza dei Signori in Verona. The exquisitely graceful campanile of S. Zeno of Verona has a two-story belfry, and it has been noted by recent observers that its sides are not strictly vertical, but have a slight entasis. (Compare Beffroi; Belfry; Bell House; Bell Tower; and see Italy, Architecture of.) (Cuts, cols. 429, 430; 431, 432; 433.)

CAMPANILE OF GIOTTO. At Florence, the bell tower of the cathedral. (See Giotto Giotto's Campanile.)

CAMPANILE OF S. MARK. At Venice; dependent upon, or belonging to the famous church of S. Mark, but separated from it by



CAMPANILE

That of Florence cathedral; begun in 1334, and, as it is thought, under the direction of Giotto di Bondone. He died in 1336, and the work was carried on by Taddeo Gaddi and others, and finished about 1350, the idea of the spire having been abandoned. The hexagonal panels in the ground story and the lozenge-shaped panels of the second tier are filled with bas-reliefs, the larger ones being of great expressional interest. The niches above are filled with statues, one of which is thought to be by Giotto.

perhaps two hundred feet of open ground — part of the Piazza di S. Marco. The tower is early mediæval work crowned by a belfry and square spire of the sixteenth century which reaches a height of 325 feet from the pavement. The ascent is by a continuous inclined plane built between an inner and an outer wall, and turning with a platform at each angle of the tower.

CAMPBELL, COLIN; architect; d. Sept. 13, 1727.

Nothing is known of Campbell's birth and education. He was a protégé of Richard Boyle, Earl of Burlington (see Boyle, Richard). His most important work was Wanstead House (Essex, England), built about 1715–1720, destroyed 1822. Campbell assisted Lord Burlington in the reconstruction of Burlington House, London. In 1726 he was appointed surveyor of the works at Greenwich Hospital, London. At the suggestion of Lord Burlington, he published, in three volumes, three hundred illustrations of English buildings under the title *Vitruvius Britannicus, or the British Architect.* Another edition, with two additional volumes by John Woolfe and James Gandon (see Gandon), was published in 1767. On the title-page of *Vitruvius Britannicus* the name is spelled Colen.

Walpole, *Anecdotes of Painting*; Redgrave, *Dictionary of Artists*; Stephen, *Dictionary of National Biography*; Campbell, *Vitruvius Britannicus.*

CAMP CEILING. A ceiling of which the central portion is flat, the sides sloping down to the walls as if following the slope of the rafters, — such as might occur beneath a roof constructed with collar beam trusses.

CAMPEDRONI, ANTONIO; sculptor.

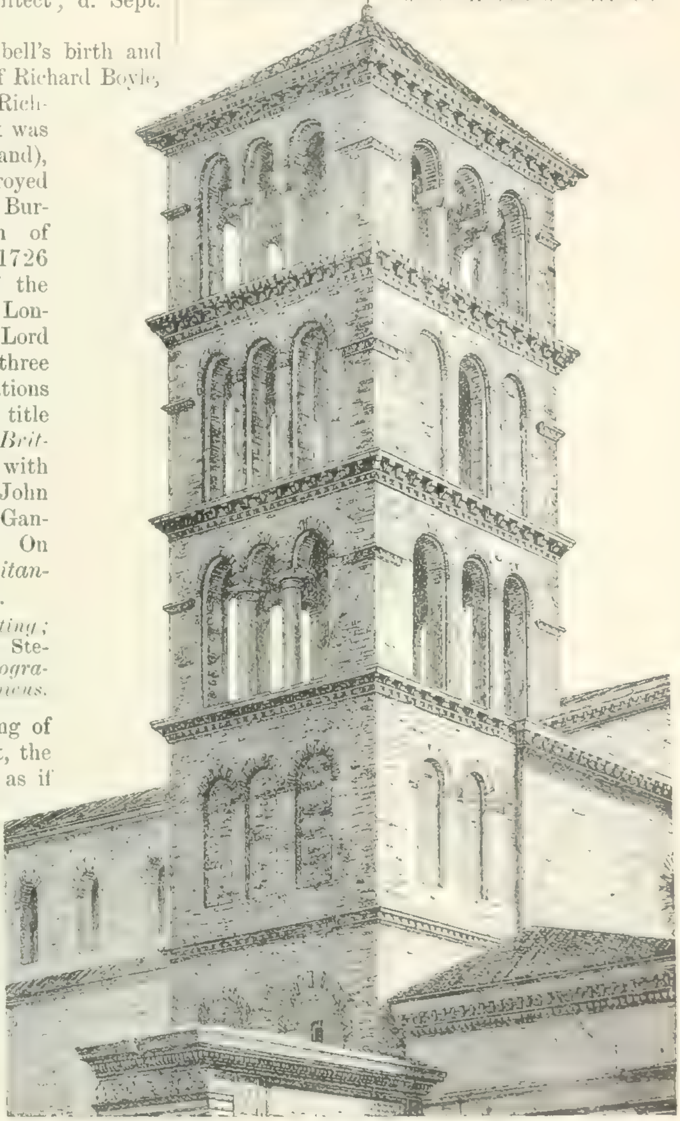
Campedroni was born in the island of Majorca (Spain), and learned sculpture from his father Francisco. In 1330 he was appointed chief sculptor of the decoration of the cathedral of Palma (Majorca).

Viñaza, *Adiciones al Diccionario historico.*

CAMPEN, JACOB VAN; architect; d. Sept. 13, 1857.

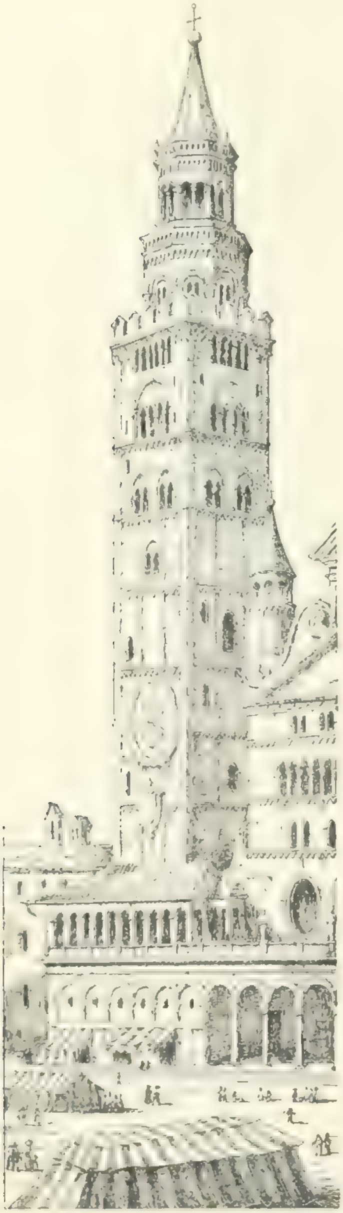
The architect Jacob van Campen appears to have been a different person from the painter of the same name. He was born near the end of the sixteenth century at Amersfoot, in Holland, and probably studied in Italy. With Daniel Stalpert he designed and built the town hall at Amsterdam, begun in 1648, finished in 1655. A monograph describing the work was published by Van Campen: *Afbeelding van't Stadthuys van Amsterdam* (Amsterdam, 1861, folio). He built the monuments to the Admirals van Galen and Tromp and numerous residences in Holland.

Weyerman, *De Levens Beschryvingen der Nederlandsche Kunstschilders*, etc.; Kramm, *Hollandsche en Vlaamsche Kunstschilders*, etc.

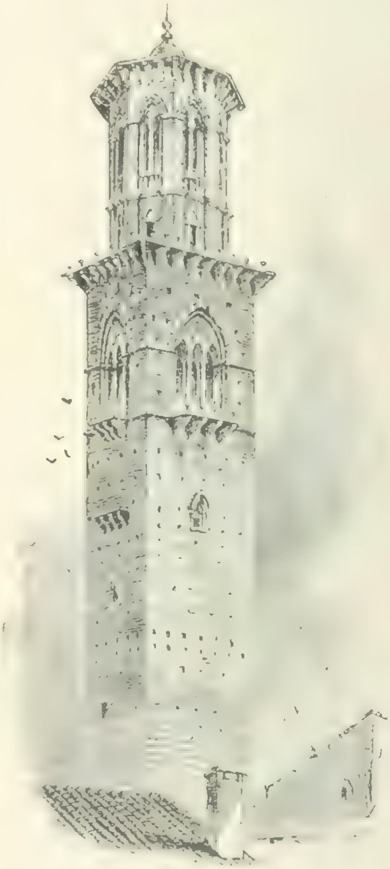


Campanile: Church of S. Giorgio al Velabro, Rome; 7th or 8th Century.

CAMPIDOGLIO. At Rome, the Capitol, or Capitoline Hill. The small open place on the top of the Capitoline Hill, between the northern crest where the citadel once stood and the southern crest where stood the Temple of Jupiter, is called Piazza del Campidoglio. It represents nearly the old asylum, properly so called. It was laid out nearly in its present form at the close of the fourteenth century, when the Palace of the Senator, so called, was built upon the substructure of the old Tabularium. In 1538 the equestrian statue of Marcus Aurelius was moved from the neighbourhood of the Lateran Palace to the centre of the square. Soon afterward the Palace of the Senator was altered according to the designs by Michelangelo, who added the colossal order of pilasters standing on a high basement, the entrance doorway, and the huge double perron; but this work was not finished until after the designer's death. This façade encloses the square on the southeast; on the southwest and on the northeast are the two fronts of the Palace of the Conservators and the Capitoline Museum. The former of these was built from designs by Michelangelo, but somewhat altered by his successor and finished about 1595. The other front, almost exactly like this in design, was not finished until 1650. All these façades are of singular interest, as showing the service expected of the colossal order by the great genius who was chiefly instrumental in recommending it to the architects of Europe. The singular magnificence of effect which it has in the hands of an imaginative and inventive artist is well shown in these fronts.



Campanile: Cathedral of Cremona, Lombardy, called Il Torrazzo (the Great Tower), as being the Highest in Italy — about 400 Feet; c. 1280.



Campanile: Palazzo Scaligeri, Verona.

CAMPIONE, BONINO DA. (See Bonino da Campione.)

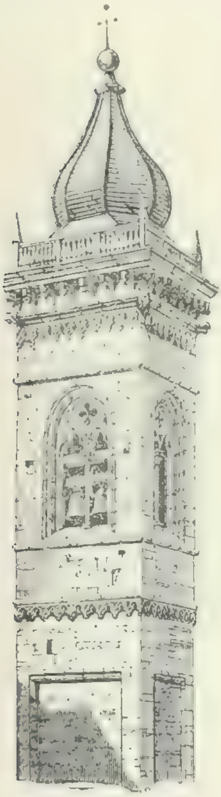
CAMPIONE, MARCO DA. (See Frisone, Marco.)

CAMPIS, JOHANNES DE. (See Deschamps, Jehan.)

CAMPO. In Italian, primarily a field. By extension, an open place in a town, sometimes such a place smaller and less architecturally important than a *piazza*. Thus, in Venice, while there is only one large and one small "*piazza*," there are many campi in different parts of the town.

CAMPO DI MARZIO. In Italian, same as Champ de Mars.

CAMPO SANTO. In Italian, a sacred or consecrated field, — that is, a burial ground; used in English for those of Italy, — of which the most famous is that of Pisa, — and more rarely for a much elaborated graveyard anywhere, with cloisters or roofed galleries containing tombs or similar architectural additions.



Campanile: Church of S. Maria Maggiore Bergamo, Lombardy: 14th Century, except the Wooden Roof.

That of Pisa is reputed to have been filled up with earth brought from Palestine. This event occurred in the twelfth century, but the high and wide cloister now surrounding the burial ground was built near the close of the thirteenth century, the pseudo-Gothic tracery of the great openings being of the fifteenth century. This cloister is filled with monuments which have been brought from many parts of Tuscany; the walls are covered with frescoes of peculiar importance. The Campo Santo at Genoa is entirely modern, at least in its present situation, about two miles east of the town. The enclosure is about 1200 feet square within the cloisters, and these latter are very broad and high and elaborate in their structure. The special interest which this cemetery has is in the very remarkable private monuments which it contains. The excellent lighting and placing which is possible in the sheltered and yet open ambulatories has encouraged the people to erect memorials of the most surprisingly vigorous, novel, and often attractive sculpture. Personifications, angelic figures, and the like are, of course, common, but there are also many portrait statues and groups in very novel arrangement and of unusual significance.

CAMP SHEATHING; CAMP SHEDDING; CAMP SHEETING. A construction of sheet piling or sometimes of horizontal planking spiked to guide piles, employed to enclose and confine the compressible soil under and adjoining a heavy structure. The term is also (in England) incorrectly applied to the stringpiece or cap sill of a wharf, properly called a camp shot.

CAMP SHOT. (See Camp Sheathing.)

CAMPUS MARTIUS (Latin). Martian Field or Field of Mars. In Rome, a tolerably level tract lying northwest of the early city and the capitol, filling the peninsula formed by the Tiber, which there makes a great turn, first to the east and then to the south. Upon this many of the important monuments of the ancient city were built, — such as the Pantheon, a great circus, the forums of Antoninus Pius and Marcus Aurelius, with their memorial columns, and the Mausoleum of Augustus. The name is the origin of some modern appellatives. (See Champ de Mars.)

CANACHUS (Kanachos); sculptor.

A contemporary of Agelaidas of Argos, he represents the school of Sicyon just before the Persian wars. His most important work was a statue of the Didymean Apollo in the temple of that deity at Miletus in Asia Minor.

Collignon, *Histoire de la sculpture grecque*; Mitchell, *History of Greek Sculpture*.

CANADA, ARCHITECTURE OF. That of the British possessions to the north and northeast of the United States. The work of the aboriginal tribes included architectural features of great interest. Those still extant are only found on the Pacific coast, and chiefly on the Queen Charlotte Islands and amongst the Haida Indians. From Dr. G. Dawson's Report of 1878, *Geological Survey of Canada*, we find that the general type of house is the same amongst all the tribes; but amongst the Haidas the houses are more substantial, greater care is given to their mechanical accuracy of construction, and in ornamentation they indicate a higher measure of originality. The special feature is their symbolical posts called *kexen*, which are of great number, size, and elaboration. They vary in height from 30 to 50 feet, with a width of 3 feet or more at the base, and are tapering. Through the base of these posts access is obtained by oval holes to the houses, which are as a rule plain. Carved posts called *xat* are also erected in memory of the dead, and are placed in front of their houses, but are not so elaborately carved as the house posts. The carving usually consists of figures of men and conventionalized representations of animals placed one above the other, and are more generally known under the title of "totem poles." The system of totems extends through many tribes, forming divisions or clans expressed by the symbolism of the eagle, wolf, crow, black bear, fin whale, etc., and many of them are exceedingly curious and interesting, and worthy of study. These villages are becoming more and more de-

[illegible] dying out, and their carved posts are falling into decay.

[illegible] of Canada, and more especially eastern Canada, which was the only portion influenced by architecture until somewhat recent times, we find no evidence of a universal distinctive style of architecture; yet we find in the past much of historical interest, each regime having left its impress on the structure of the country. Canada covers so large an area that as its climate greatly varies, so its different geographical divisions show certain distinctive characteristics in their buildings.

The French régime in what was formerly Lower Canada is still commemorated by many solid old stone houses, with high, steep roofs, gable ends, moulded springer stones, and small dormers, which remain all over the country and in the cities of the province. The simple village church, with its quaint tin-covered spire or belfry aged to a beautiful golden hue, still charms by its suitability and appropriateness.

In Acadia and the maritime provinces the evidences of British influence are stamped very closely on the older architecture. The earlier buildings are either translations in wood of existing buildings in England, such as S. Paul's church in Halifax, built in 1750, or are closely modelled on such buildings. Many of these are of stone, most solid and substantial in character and excellent in design. The Houses of Legislature for Nova Scotia and Government House in Halifax, built early in the nineteenth century, may be cited as examples.

Coming to a more recent period, between 1840 and 1850, a number of refined and excellent buildings were erected in Montreal in the Greco-Roman style, — such as the old court house, the banks of Montreal and of British North America, and others, — but all these were the work of English architects who came out for a time. Since confederation, Canada has made extraordinary progress, and the completion of the Canadian Pacific Transcontinental Railway has united the dominion into a homogeneous whole. This has had an immediate effect on its current architecture. Distinctive provincial features are disappearing, and modes of construction and design prevalent in the Old World and in the United States are taking their place. Gothic, Colonial, Romanesque, Renaissance, have all had their advocates more or less skilled. In ecclesiastical architecture amongst Protestants, Gothic and Romanesque styles are almost universal, while among the Roman Catholic community the tendency is largely toward neoclassic of some type.

In civic architecture the Dominion Houses of Parliament at Ottawa are probably the most notable example of a successful adaptation of Gothic to modern requirements. Amongst the important examples of Romanesque work may be cited the new city hall at Toronto, the Houses of Parliament in the same city, and the Library and Physics Buildings of McGill University, Montreal. In Renaissance — French, Italian, and English — there are many examples, amongst which might be named, as more or less successful, the new Houses of Legislature for British Columbia at Victoria, several bank buildings in Vancouver, various mercantile and civil buildings in Toronto and Montreal, including the city hall in the last-named place, Laval University, and the more recent buildings at McGill University, and in Quebec the Houses of Legislature. Lately a phase of Scotch Baronial has been introduced very successfully in the Royal Victoria Hospital, Montreal; and the Château Frontenac at Quebec is a clever adaptation of the château architecture of the Loire Valley. — ANDREW T. TAYLOR.

CANAL. *A.* A channel or groove; usually other than the channel of the Doric column or the flute of the Ionic, — as below the corona of a classical cornice, acting as drip, or as the narrow separation between two leaves or similar ornaments in a sculptured moulding.

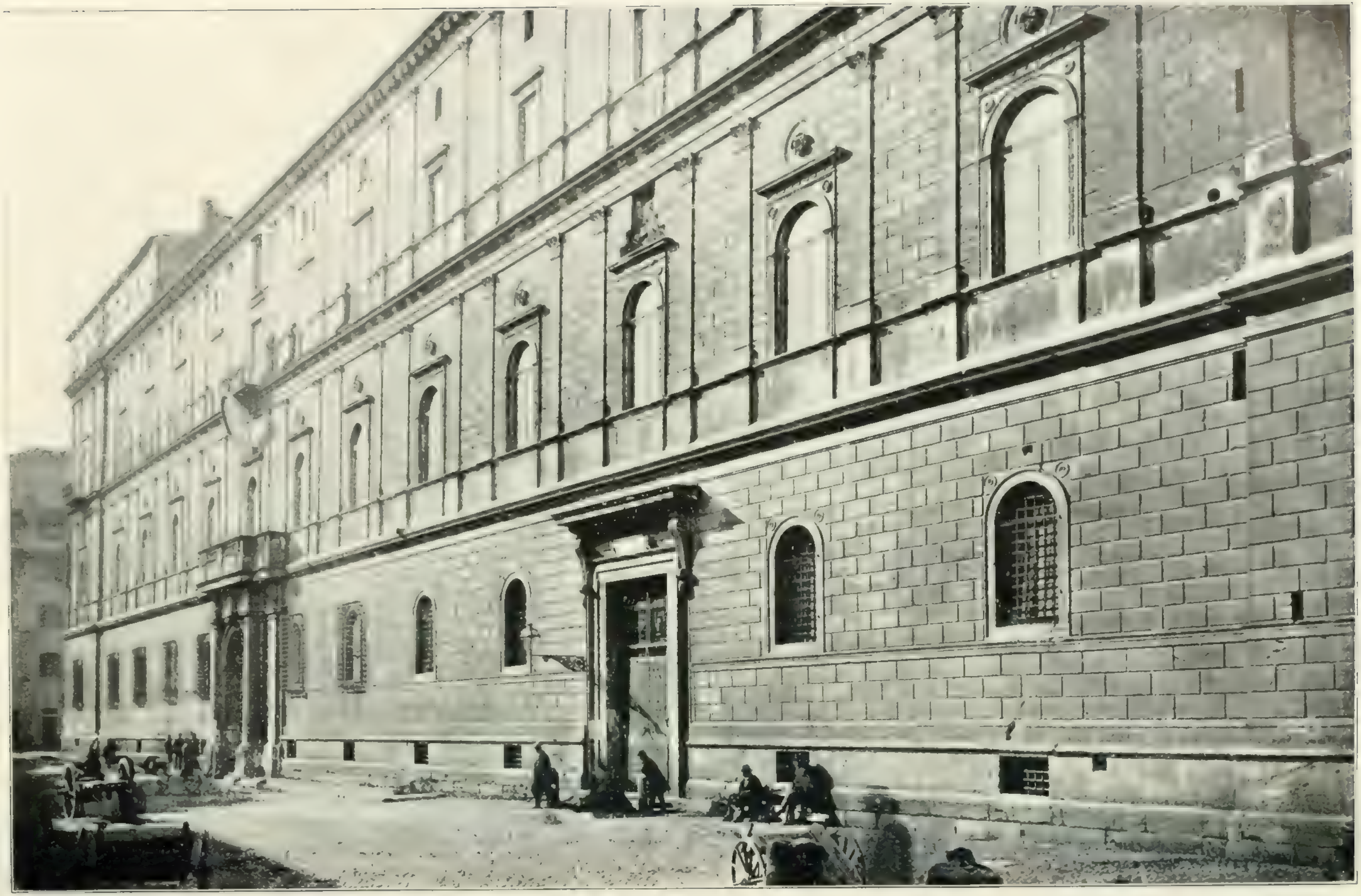
B. An artificial water channel, usually of considerable size, and without roof or cover, but having generally carefully finished straight parallel sides. In decorative gardening the canal is generally a long and narrow piece of placid water along which the current passes slowly; but there are exceptions. Thus in the English Garden at Munich the waters of the Iser are partly turned into watercourses of uniform width with scarped and regulated banks in which the current is very rapid. The canal used in commerce for the cheap transportation of freight, and formerly for passengers, does not enter into the scope of this Dictionary. (See Canale.)

CANALAZZO. Same as Canal Grande, the popular Venetian name.

CANALE. In Italian, a water channel. The common translation of this word by "canal" often causes confusion, as when the water streets of Venice, and especially the largest of them, are called by that name. The Venetian term is *Rio* for all but the largest, the four most important of which are given immediately below.

CANALE, or CANAL', DELLA GIUDECCA The water street which separates the Island of the Giudecca from the Island of the Rialto. This water way varies from 700 to 1200 feet in width, and connects with the Canale di S. Marco, forming with it the harbour of Venice.

CANALE DI S. MARCO. The great broad stretch of deep water lying between the Molo and the Riva degli Schiavoni beyond it on the north and the islands of the Giudecca and of S. Giorgio Maggiore on the south. This is the anchorage for large vessels, and forms with the preceding the principal harbour of Venice. It is

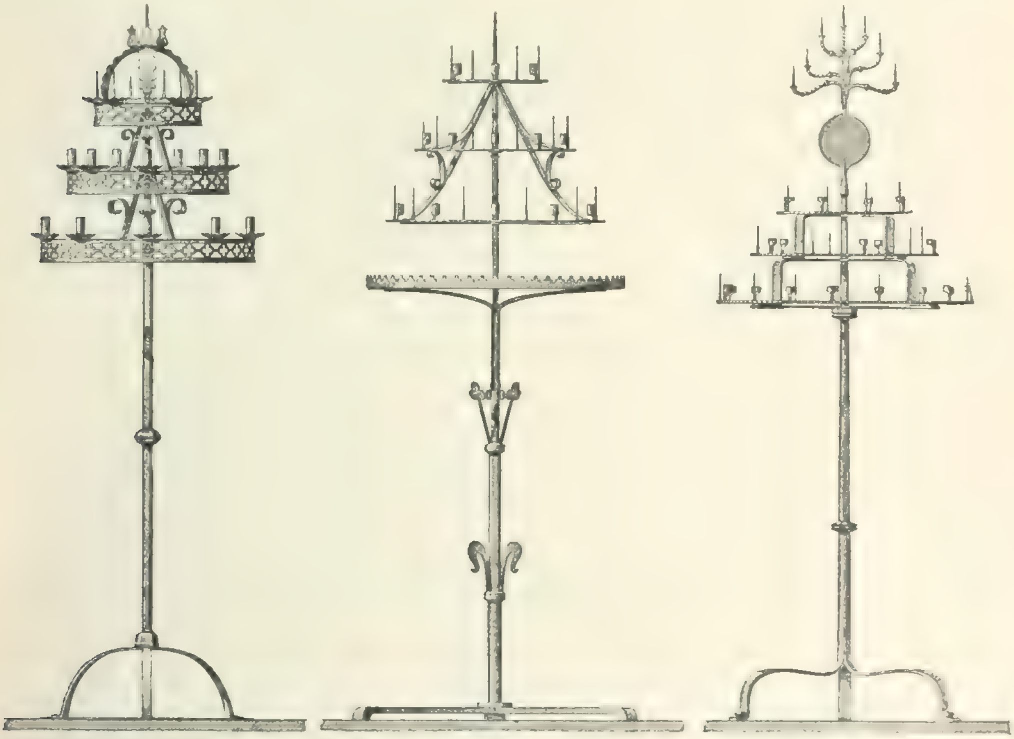


CANCELLERIA

Rome; palace called della Cancelleria because formerly occupied by the chancery of the papacy. The building has been ascribed to Antonio Montecavallo and to Bramante, but it is probably earlier than the career in Rome of either. It is one of the most delicate and refined buildings of the true Italian Renaissance.

1200 feet wide in the narrowest part, and widens rapidly as it turns to the southward, east of the islands named above.

CANAL' GRANDE. The principal water street of Venice, having the form of an S reversed and a length of nearly a mile from the Dogana di Mare to the lagoon at the northwest of Venice. It is narrowest at the Rialto Bridge, — about 130 feet, — but is nowhere more than 250 feet wide, except where it enlarges greatly at the point of connection with the Canale di S. Marco. The awkwardness of calling this the "Grand Canal" is apparent, for the Venetian term merely means the wide channel or wide water way; but no change in English nomenclature is likely to take place.



Candelabrum: Three Wrought-iron Candelabra for Church Use, 14th and 15th Centuries

CANAREGGIO (CANALE REGGIO, or Royal Channel). Much smaller than the three Venetian "canali" named in previous articles; leading from the Canal' Grande to the lagoon at the north of the city.

CANCELLERIA. In Italian, a chancery, or the residence of a chancellor.

Palazzo della Cancelleria. A private palace in Rome, built between 1486 and 1495, and originally by an architect whose name has not been discovered. The court is probably from the design of Bramante, but the entrance gateway was later, and has been ascribed to Domenico Fontana. The building is famous for its delicacy of detail, and especially for the graceful, well-proportioned, and beautifully adorned court with a two-story arcade. The name is derived from the establishing within its walls, not long after their completion, of the papal vice-chancellor's offices.

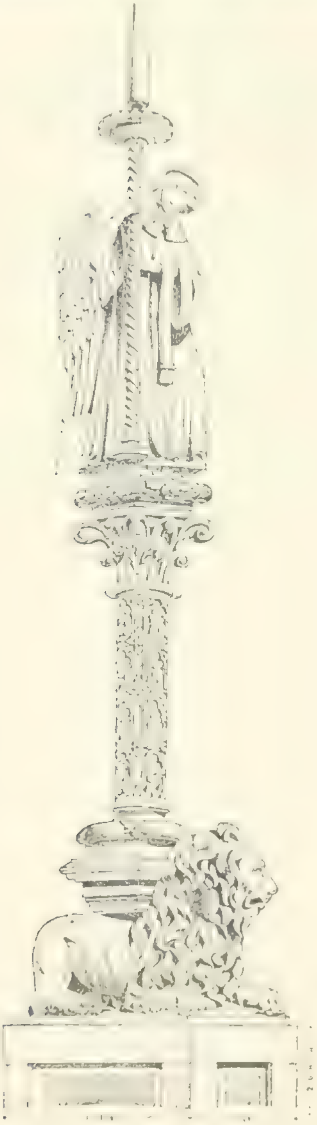
CANCELLUS (pl. Cancelli). In Latin, usually in the plural, any barrier or screen formed with bars; particularly the bar between the court and spectators in a pagan basilica, and between the clergy, or clergy and choir, and the congregation in a Christian basilica, whence Chancel. The cancelli of antiquity might be of bronze, iron, stone, or wood. (See Choir Screen; Rood Screen.)

CANDELABRUM. *A.* In Latin, a lampstand. Some of those known to us are very small and low; but those which are of interest architecturally are high and of considerable pretensions. Some of these are of bronze, and very slender; but others are cut in marble or fine-grained stone, and are sometimes 5 or 6 feet high, and very massive. The forms of these last have entered somewhat into neoclassic decoration.

B. A candlestick made decorative by wrought work in metal, enamel, or the like; especially one having several sockets for candles, and of large size. (See Girandole.)

C. A modified column, small and decorated, and usually engaged. The typical form is that of a [illegible] shaft with a floral capital, the whole springing from a cluster of leafage below.

D. By still further extension, an upright [illegible] of scroll work in painted decoration, mosaic, or the like. To receive this title, which is vague in its application, the scroll pattern should have a formal central rib nearly straight and nearly vertical, from which the scrolls are thrown off on either side.



Candelabrum of Marble; Baptistery, Florence.

CANDELABRUM COLONETTE. Same as Candelabrum, *C.*

CANDID, PETER. (See Witte, Peter de.)

CANDLE BEAM. A horizontal beam, plain or decorated, upon which are displayed the candles offered before a shrine or kept burning for any liturgical purpose. These are usually held by prickets, each of which has a saucer or tray to hold the drippings. (Compare Rood Beam for a secondary and ornamental use.)

CANDLE POWER. The English unit of illuminating power. A lamp or light of any kind is of one candle power when it gives the same amount of light that is given by a sperm candle weighing six to the pound, and burning at the rate of 120 grains an hour. Standard illuminating gas, burning 5 feet an hour, gives a light of 16 candle power. The ordinary incandescent electric lamp is of 16 candle power. The electric arc lamp is usually either about 1200 or 2000 candle power.

CANEPHORA; CANEPHORE. Literally a basket carrier. The term is applied to figures of maidens bearing baskets of offerings and utensils in the sacred Athenian processions as represented in Greek sculpture; and thence a female figure with a basket-formed capital upon the head, used as a pillar; a Caryatid.

CANINA, LUIGI; architect and archæologist; b. Oct. 23, 1794 (at Casale in Piedmont); d. Oct. 17, 1856 (at Florence).

About 1826 Canina was commissioned by the Prince Camillo Borghese to enlarge and restore the Villa Borghese (Rome), which was built for Paul V. (Pope 1605–1621). He directed the excavations undertaken by Leo XII. (Pope 1823–1829), Pius VIII. (Pope 1829–1830), and Gregory XVI. (Pope 1831–1846) in the Roman Forum, the Appian Way, and the Campagna. The results of his archæological investigations were published in numerous works, which are almost wholly discredited because of the large part which conjecture had in their preparation. The tendency of modern investigation has been to prove them erroneous in almost every respect.

Raggi, *Della Vita e delle Opere di Luigi Canina*; Folchi, *Discorso in Encomio del Commendatore Luigi Canina*.

CANO, ALONZO; painter, architect, and sculptor; b. March 19, 1601 (at Granada); d. Oct. 5, 1667.

He learned the elements of architecture from his father, Miguel Cano, and studied sculpture with Juan Martinez Montanes. His family having moved to Seville, he received instruction in painting from Juan del Castillo of that city and Francesco Pacheco. In 1628 he continued the construction of the retable of Lebrija begun by his father. In 1637 he went to Madrid to decorate the palace of the Duke of Olivarez. In 1650 he was employed on the cathedral of Toledo. Although Cano did not study in Italy, his work shows the influence of the Italian masters of the period.

Bermudez, *Diccionario Historico*; Stirling-Maxwell, *Annals of the Artists of Spain.*

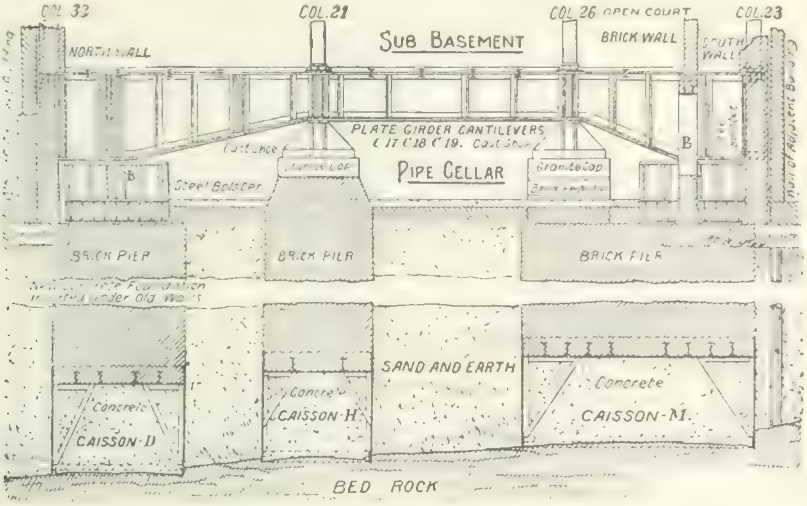
CANO, MIGUEL. (See Cano, Alonzo.)

CANOPY. A rooflike structure usually supported on pillars or projecting from a wall, and serving rather a decorative than a protective purpose. It may be movable, as when carried above an important person in a procession, and may consist of an awning of silk or other material supported on poles; or it may be of light material and permanently placed, as above a bedside, whether supported by the posts or hung from the ceiling; or it may be of solid material. In a Gothic niche, the canopy is the most important part. (See Baldachino; Ciborio; Tester.)

CANTHARUS. *A.* In Roman antiquity, a two-handled cup; hence that part of a fountain which holds the water, or the upper basin only.

B. A basin or fountain of ablutions in the atrium of a mediæval or early Christian basilica.

CANTILEVER. A member intended to support an overhanging weight, like a bracket; but generally of large size and having a projection much greater than its height; especially, a projecting beam — one which is fixed in a wall or other support at one end, the other end being unsupported. Applied to a bridge or a beam, it means an end projecting beyond the support.



CANTILEVER.

CANOVA, ANTONIO; sculptor; b. Nov. 1, 1757; d. Oct. 12, 1822.

Canova was born at Possagno near Treviso, Italy. His most important work in Rome is the monument of the Pope Clement XIII. in S. Peter. He designed also the monument to Clement XIV. in the church of the S. Apostoli. In the last years of his life he erected a temple (the church of la Trinità) at Possagno, in which he endeavoured to combine the rotunda of the Pantheon with the façade of the Parthenon.

Meyer, *Canova*, in *Knackfuss, Künstler Monographien*; Quatremère de Quincy, *Canova et ses Ouvrages*.

CANT (n.). *A.* The angle or inclination of a piece or member to the general surface, especially to the horizontal, hence, —

B. A portion or surface which makes an oblique angle with adjoining parts, especially a slope of considerable relative extent. (Compare Bevel.)

CANTALIVER. (Same as Cantilever.)

CANT BOARD. A board set at a slope, especially when so placed to shed water, as for a coping.

CANTERBURY, MICHAEL DE. (See Michael de Canterbury.)

In the illustration, the girder forming cantilevers being symmetrical, half the entire load is carried by each pier, under columns 21 and 26; the weights of columns 33 and 23 balancing each other. When the girder projects at only one end, as at the north, the weight of column 33 on the cantilever would produce a downward pressure on the pier at column 21; and an upward tendency at column 26.

CANTING. *A.* Sloping or tipping, especially from the horizontal.

B. The cutting away of the corner of a rectangular beam or sill so as to form a bevelled or oblique plane intermediate between the original faces. (Compare Chamfer.)

CANTONED. Provided or adorned at the exterior corners with projecting members such as pilasters, engaged columns, or quoins.

CANTORIA. In Italian architecture, a tribune gallery or balcony for the singers in a church.

CAP. The crowning or terminal feature of a vertical member of any structure, either fitting closely upon it or extending somewhat beyond it in horizontal dimensions; thus distinguished from a Hood. The capital of a column, pilaster, or post, the surbase or capstone or top of a pedestal, the cast iron head of an iron or timber post, the crowning horizontal timber of a stud partition, a timber bolster on a post to diminish the unsupported span of the superstructure, are alike called caps, and the term is also used of a wall coping, door lintel, or handrail as of a balustrade. (See Capital.)

CAPARRA (NICOLÒ GROSSO); iron worker.

Caparra revived the art of working in wrought iron, which had fallen into disuse during the early Renaissance period. His most famous works are the iron lanterns and torch holders of the Palazzo Strozzi in Florence, which were placed in position Nov. 16, 1500.

Muntz, *Renaissance*; *Ricordi di Architettura.*

CAPELLA. In Italian, a chapel. (See titles below.)

CAPELLA COLLEONI. (See Colleoni Chapel under Chapel.)

CAPELLA DI GIOTTO. (See Arena Chapel, under Chapel.)

CAPELLA MALATESTIANA. (See Tempio Malatestiano.)

CAPELLA DI S. MARIA DELLA SPINA. (S. Maria of the Thorn.) Pisa; built on the quay or Lungo Arno and partly overhanging the water; much injured by restoration.

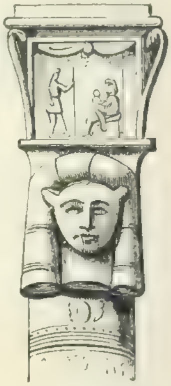
CAPELLA DEI PAZZI. At Florence, connected with the church of S. Croce and built by Brunelleschо in 1425, and assumed to be his earliest work in the classical taste of which he was the first exponent in modern times. The building itself is very small and its chief importance lies in its vestibule of entrance, or narthex.

CAPELLA SISTINA. (See Sistine Chapel, under Chapel.)

Capital: Lotus Bud Capital from Temple at Luxor.

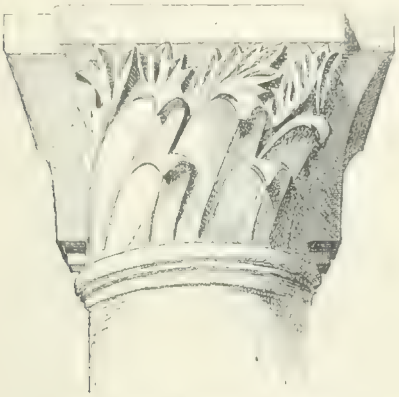
Capital: Papyrus Capital from Rameseum, Thebes.

Capital from the Temple of Karnak.



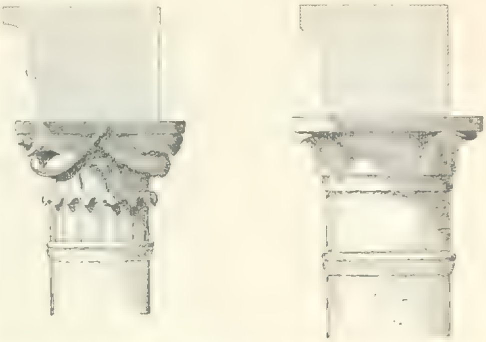
Capital: Hathor Capital at Denderah, Upper Egypt.

CAPITAL. The topmost member of a column, if separated from the rest of the column by distinct architectural treatment. By extension, also, the uppermost member of an Anta, Pilaster, or Respond when treated as a separate architectural feature and to correspond with the capitals of columns, though not necessarily precisely similar in design. The earliest columnar architecture which we know, that of Egypt under the Old Empire, has capitals which do not expand at the top; and which have no constructional reason whatever, but are wholly decorative in character. Those of Grecian Doric of the sixth century B.C. are widely spreading; but their spread serves no practical purpose except in the direction of the axis of the epistyle, and here, very little. The design in the one case is that of a budlike termination of the column, swelling out rapidly below and falling in again less rapidly, so that the top is even smaller than the necking or top of the shaft. (See Egypt, Architecture of.) In the other case, the design was of a very decided projecting mass, pleasantly rounded in every direction, but still cutting boldly the upward lines of the shaft. The difference is radical, but it is a purely artistic difference. In Japanese post and beam construction, even on the largest scale, there is nothing that can be called a capital, but the upright post supports the lintel without intermediary member, or it has a metal socket into which it fits, or it terminates at top in a series of brackets. In the earliest stone building of India, that which we know as Buddhist architecture, the columns are hardly separated in treatment from the clustered shafts, vertical mouldings, and rounded piers which make up the great mass of the pagoda or cave temple. The capitals of isolated columns are, therefore, rather of the nature of mouldings, and enrich whole bands or string courses which have been carried around those separate vertical members in partial imitation of the bands which adorn the walls. It seems doubtful whether Assyrian architecture or that of the Mesopotamian plain at any period in antiquity was columnar in its character, but the architecture of the earlier Persian empire contains columns whose heads are decorated with sculptured beasts, not in relief, but in bold separate projection — heads of lions, heads and fore legs of horses, and the like. These double capitals, as they are often called, serve the purpose merely of carrying between these two projections the longitudinal

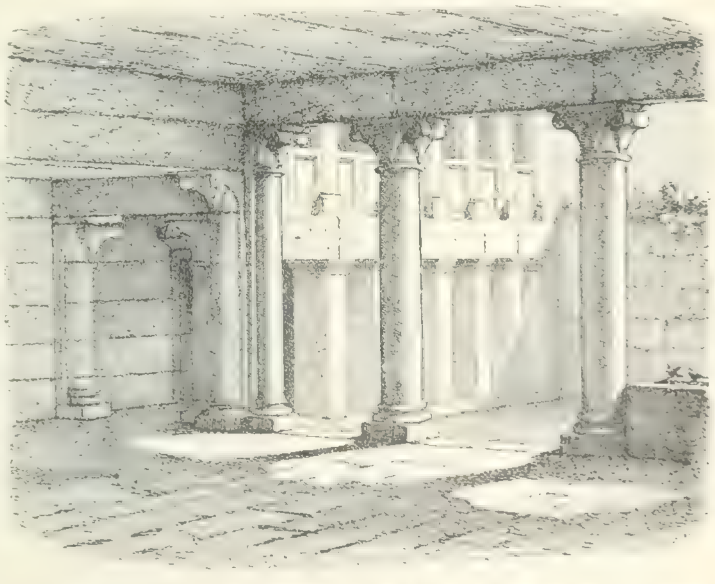


Capital from Betoursa, Syria.

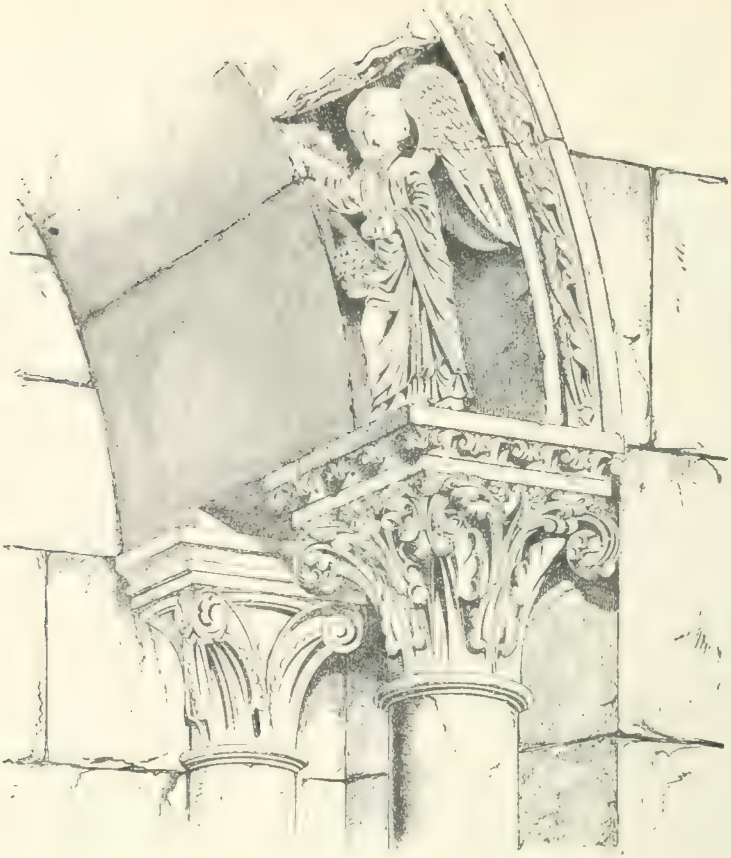
girder which carries a roof, and the capital is again a purely ornamental feature used to decorate that important point of the columnar structure where the vertical passes into the horizontal. It has been urged that the Ionic capital took its origin in a short longitudinal piece forming two corbels, and intended to diminish the unsupported reach of a lintel, girder, or beam between two posts. That is to say, the theory is that the Ionic column is the development in stone, and in highly specialized architectural form, of a short transverse piece of wood put at the head of a wooden post in order to help that post carry the girder which rests upon it. Recent discoveries of early capitals adorned with volutes, those which are called now proto-Ionic, have made this theory impossible, and it is clear that the Ionic capital also is of purely decorative character. It is curious that the general form and the general system of adornment which rises before the modern mind when the word "capital" is mentioned, first take shape in what is known as the Corinthian capital, an invention of the latest days of unmodified Grecian design. Ever since this first calling into being of the capital, consisting of the smoothly rounded bell upon the surface of which is applied elaborate foliated ornament in high relief, that type has been the one resorted to by all styles of architecture which have not drawn their inspiration directly from Greco-Roman sources. Throughout the Middle Ages the capital was more or less a reminiscence of the Corinthian form. The capitals of Byzantine architecture are closely studied from it, even although their general curves may have been convex instead of concave. The capitals of the Romanesque and Gothic styles in like manner were, except in a few isolated cases, — such as the moulded "Early English" capital, — similar modifications of the foliated bell. In this connection, too, the capital was found to be capable of doing what it has been rashly stated that capitals were originally intended for, namely, to gather upon the top of the shaft the superincumbent load when much larger in horizontal diameter. Thus, in many Gothic churches, a pier of about three feet in diagonal dimension will be found resting upon the abacus of a capital, which in its turn rests upon a shaft not



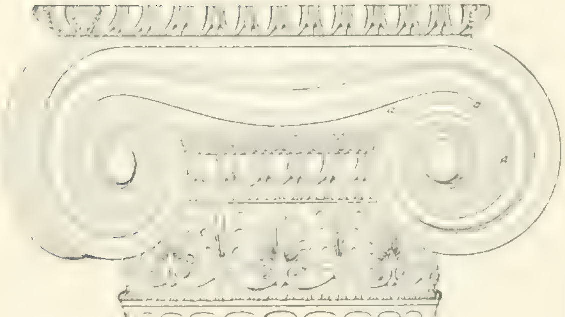
Capitals from Houses near Serdjilla, Syria. c. 400 A.D.



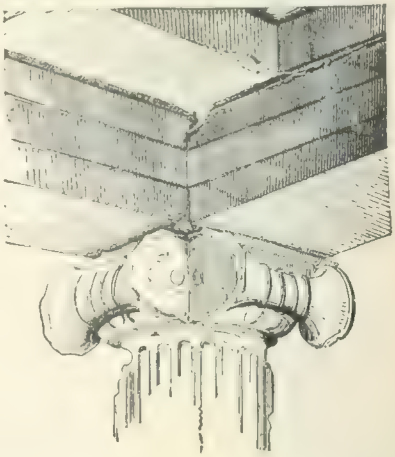
Capital with Great Projection in the Plane of the Wall above, thus affording a Large Bearing for the Lintels. From Bagouza, Syria.



Capital from Tomb in North Side of Choir, Cathedral of Rouen.

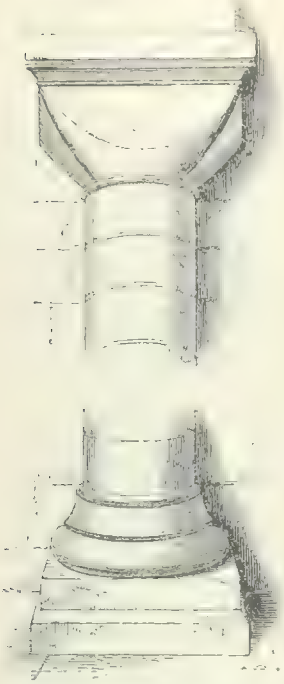


Capital. Ionic Corner Capital from Erechtheum.



Capital: Corner Capital from Temple of Athena Nike; Close of 5th Century, B.C.

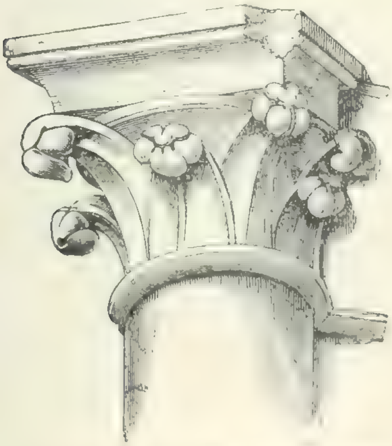
more than a foot in diameter; the bell of the capital being carefully and successfully designed to carry, by means of its spreading form, the heavy mass above by visible and natural gradations of the slender upright of stone which really supports it. Even in these capitals, however, the abacus projects somewhat beyond the vertical faces of the superincumbent load; these slight projections having been always considered by the architectural designer an essential part of the capital of column or pilaster. Since the time of the Greeks all columnar architecture has made much of its capitals, and these have been important elements of the general design. (Cuts, cols. 450; 451.)



Capital: Shaft from North Transept, Winchester Cathedral.

Double Capital. *A.* One furnished with a Dosseret, *A*.

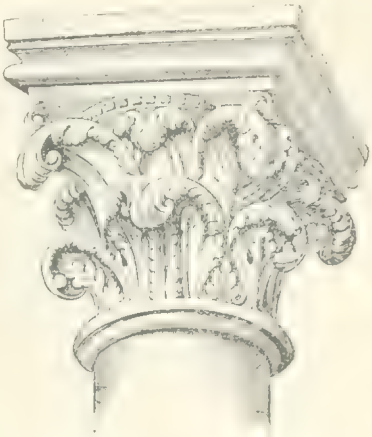
B. One as described in the account of Persian columns in the article above.



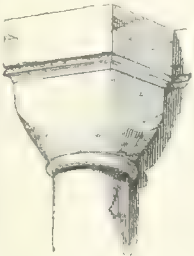
Capital: S. Nicolas, Blois; c. 1200.

Upper Capital. (Same as Dosseret, *A*.)

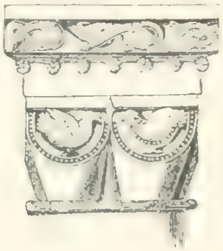
CAPITOL (Capitolium). *A.* In Roman archæology, the Temple of Jupiter upon the hill at the northwestern end of the Roman forum, which was called from it the Capitoline Hill. Hence, the hill itself; this hill had two peaks which are still noticeable, having between them the modern square called the Campidoglio, which was formerly the asylum proper; it is now generally thought that the southwestern peak was the site of the temple and the northwestern peak the site of the citadel, or Arx. The name *capitolium* was extended to the entire hill, and this hill was itself surrounded by a wall in very ancient times, and was a fortress



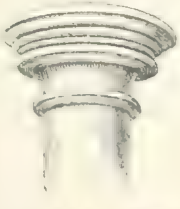
Capital: Soissons Cathedral: c. 1212.



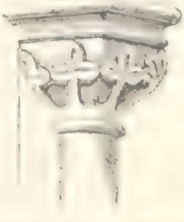
Capital: Norman Cushion Capital, Cassington, Oxfordshire.



Capital: Norman; Steetley, Derbyshire.

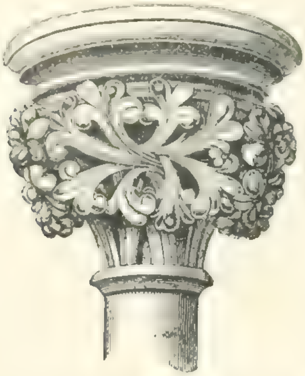


Capital: Early English; Hampton Poyle, Oxon.

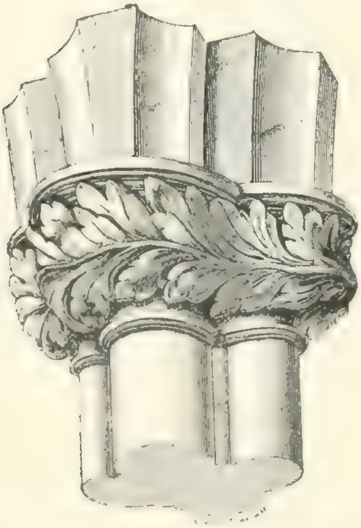


Capital: Early English; Haseley, Oxon.

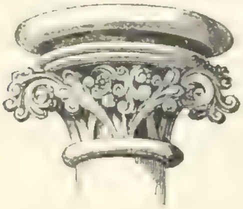
within the greater fortress of Rome, and enclosing the earlier and smaller fortress of the Arx. Throughout antiquity, the hill was conveniently accessible only from the side of the forum, and this by the steep street up which passed the triumphal procession of a victorious general. In modern times, a flight of one hundred and twenty-four steps leads to the church of Ara Cœli which stands on the site of the Arx; a sloping ramp with steps at intervals leads up to the Campidoglio, and, from this, access is easy to the capitolium proper, or site of the Temple of Jupiter, which has been occupied by private buildings.



Capital: Presbytery, Lincoln; c. 1260.



Capital: Harrington, Northamptonshire; c. 1300.



Capital: Chapter House, Southwell.

B. In modern times, and especially in the United States, a building in which meets a legislature; as the legislature of the United States or of one of them. The Capitol at Washington was built in 1827, and consisted of a centre and two wings with three low domes, the Senate occupying the northernmost, and the House of Representatives the southernmost wing. Between 1851 and 1865 the building was greatly enlarged by the addition of new wings, into which moved the two Houses of Congress; and a lofty dome composed chiefly of cast and wrought iron was built at the same time, reaching a height of two hundred and ninety feet. The Capitol was built with its principal façade to the east, and it was thought that the city would grow up on that side, leaving the White House at some distance in the country; but the growth of the city has been generally to the west of the Capitol.

The building is not as elaborate as the Westminster Palace, having fewer committee rooms, lunch rooms, libraries, and the like; and the Library of Congress, which is large, occupies a separate building since 1897. It is divided into three main blocks, that of the Senate toward the north and that of the House of Representatives toward the south, being the wings added before 1865, while the central block contains the Rotunda, the Supreme Court room, which occupies the old Senate Chamber, and the Statuary Hall, which occupies the old House of Representatives. The present Hall of Representatives is 140 feet long and 93 feet wide, but only 30 feet high, its glass roof preventing, to a certain extent, the appearance of insufficient height. This ceiling affords light to the whole floor and the galleries. The galleries do not project over the floor of the House, but are supported in front on walls, beyond which, and beneath the galleries, are committee rooms and the like. These galleries are open to visitors and will hold 2500 persons at one time. The floor of the House affords room for desks and arm chairs for all of its members, 356 in number, and it is customary for them all to be in place, except for the accidents of illness or absence. The Senate Chamber is similar to the Hall of Representatives in all respects, but smaller. The desks and chairs, committee-rooms, galleries, and glass roof are all repeated. There is nowhere in the interior of the Capitol any great delicacy or refinement of design, and heavy expense for artistic decorations has been avoided, except for the wall paintings in the Rotunda, which are generally unimportant as works of art.

CAPITOLE. In the south of France, a building supposed to represent the Capitol of Rome, or of a province; it being assumed that the principal building of any Roman colony would have that name. The best known of these buildings is the one at Toulouse (Haute Garonne); it is the palace of the municipality, or Hôtel de Ville. The exterior was built in the middle of the eighteenth century.

CAP PIECE. Same as Cap in its general signification of a part of a frame, a wall, or the like.

CAPRINO, MEO DEL. (See Meo Del Caprino.)

CAR. The platform or enclosed chamber of an elevator or lift.

CARACCI, AGOSTINO; b. Aug. 16, 1557; d. March 22, 1602.

CARACCI, ANNIBALE; b. Nov. 2, 1560; d. July 15, 1609.

CARACCI, LUDOVICO; b. 1555; d. 1610.

These three painters, of whom Ludovico was the oldest and the uncle of the other two, were of very great celebrity in the seventeenth century and down to the middle of the eighteenth; their more important works, especially those of Annibale, being still cited in old-fashioned books of instruction and reference as ranking with the first paintings in the world. Modern opinion has turned in a very different direction, and, while admitting the immense abilities of these painters, is inclined to rank them much lower in the scale of good taste and true artistic power. They did some mural and decorative work, especially in Rome.

Bolognini, *Vite dei Pittori ed Artefici Bolognesi*; and in the General Bibliography, Bryan; Scribner; Seubert.

CARADOSSO. (See Foppa, Ambrogio.)

CARAVANSERAI. In Turkey and Persia a building for the lodging of travellers and usually erected by a monarch or wealthy benefactor as a work of public beneficence, upon a frequented caravan route. Those of Persia are the finest, usually enclosed by a solid wall, entered by an imposing gateway, and provided with a great number of vaulted lodging chambers in one or two stories, with a fountain of ablutions, *latrines*, a prayer platform and stabling for camels and horses. (See Khan.)

CARBONEL, ALONZO; sculptor and architect; d. September, 1660.

He designed the altar and pavement of the church of the monastery of the Escorial. At the death of Juan Gomez de Mora, Carbonel was made chief master of all the royal works.

Bermudez, *Diccionario Historico*; Carl Justi, *Diego Velasquez*.

CARCASE; CARCASS. A building, or any part or element of a building, finished as to its main construction. This term is evidently of loose application; thus, the carcass of a house might be either the framing and floor timbers without siding, flooring, or roofing, or the building with those additions, but without inside trim, window sash, etc.

CARCASS FLOORING. The naked framing of a floor, comprising all the supporting timbers, but without either ceiling or floor boards. (English usage.)

CARCASS ROOFING. The naked framework of a roof, without its sheathing or roof covering. (English usage.)

CARCER. *A.* In Latin, a prison; hence in modern European languages any room or building answering the purpose of a prison. Often used jocosely, as by the students of the German universities.

B. (In the original Latin meaning, an enclosed or confined space.) One of the chambers at the starting place of a Roman circus. Each one seems to have been reserved for a single chariot and its horses, and it was from these *carceres* that the chariots all started together at the signal. (See Circus.)

CARDI, LUIGI (CIGOLI); architect, painter, poet, musician, anatomist; b. 1559; d. 1613.

Cardi was born at the village of Cigoli, near Florence, and was a pupil of Buontalenti (see Buontalenti) in architecture. He built the Loggia de' Tornaquinci, the portal of the convent of S. Felicità, and the Palazzo Renuccini in Florence. In Rome he began the palazzo in the Piazza Madama (now dei Senatori), which was finished by Marucelli.

Gurlitt, *Geschichte des Barockstiles in Italien*; Milizia, *Memorie*.

CARILLON. A chime of bells. The French term signifying a number of bells grouped together, and so differing in size and tone as to be capable of producing musical combinations of sound. In English, as in French, the term is extended to mean the sound itself, especially when a large number of bells is employed. The most remarkable carillons are those in Belgium and the Netherlands. It is stated that a church in Delft had once a thousand bells, but the chimes now existing have a much less number. Several of those in Belgium are of more than 150 bells, the smallest of which is scarcely larger than the dinner bell of a country tavern. Ordinarily the hammers of the bells are moved by means of wires attached to a piece of machinery with a revolving drum. The mingling of sound is not very artistically planned, and is rather a pleasant jangle of separately agreeable notes than a connected piece of music. In some of the towns of Belgium the carillon is rung every quarter of an hour.

CARISTIE, AUGUSTIN NICOLAS; architect and archæologist; b. Dec. 6, 1783; d. Dec. 5, 1862.

The earliest-known Caristie was Michel Ange, a Piedmontese, who built the college of the Jesuits at Autun (France) in 1709, and rebuilt the church of the Celestines at Amiens (1726–1732). The father of Augustin Nicholas was an architect in Dijon at the end of the 18th century. A. N. Caristie went from Lyons to Paris to study with A. L. T. Vaudoyer (see Vaudoyer, A. L. T.) and Ch. Percier (see Percier), and won the *Grand Prix de Rome* in 1813. In 1824 he was commissioned by the minister of the interior to examine the condition of the Roman triumphal arch at Orange, and to report concerning the means required to restore and preserve it. He investigated also the Roman theatre at Orange. Caristie published his results in two works, *Notice sur l'État Actuel de l'Arc d'Orange et des Théâtres Antiques d'Orange et d'Arles*, etc. (4to., Paris, 1839), and *Monuments Antiques à Orange : Arc de Triomphe et Théâtre* (large folio, Paris, 1856). He completed the restoration of the arch in 1829, and exhibited his drawings in the Salon of 1831. In 1824 he was charged with the design and construction of the Mausoleum to the victims of Quiberon, and in 1827 appointed architect of the presbytery of the Madeleine (Paris). In 1842 he undertook the restoration of the château of Anet, especially the great portal and chapel.

César Daly, *Notice nécrologique* in *Revue Générale*; Ch. Lucas, *A. N. Caristie* in *La Grande Encyclopédie*; Bauchal, *Notice sur Caristie*.

CARISTIE, MICHEL ANGE. (See Caristie, Augustin Nicholas.)

CARL. (A German form of the name Carolus; in English, Charles.) For words beginning with this proper name, such as Carlsbrücke, see Karl.

CARNEL. Same as Crenelle, in the sense of an embrasure of a battlement.

CARPACCIO, VITTORE; b. in the middle of the fifteenth century: d. after 1522.

A painter whose principal pictures are in the academy of Venice, but who has left in the little chapel of S. Giorgio dei Schiavoni a series of small wall paintings of very original and unusual character. These have been praised in the most enthusiastic way by some English critics. The large paintings illustrating the life of S. Ursula have been moved from the suppressed scuola named from that saint. It is to be noted that the wall pictures of the Venetian school were commonly painted upon canvas, and easy of removal; that school, with all its magnificent achievement, having failed to discriminate as closely as the Florentines or as Correggio between the mural painting proper and the large removable painting in a frame.

(See, in General Bibliography, Bryan; Seubert.)

CARPEAUX, JEAN BAPTISTE; sculptor; b. May 11, 1827 (at Valenciennes, Nord, France); d. Oct. 12, 1875.

Carpeaux was the son of a poor mason of Valenciennes (Nord, France), and studied first at the academy of that town. Oct. 2, 1844, he entered the *École des Beaux Arts* in Paris. He was a pupil of Duret, but was influenced much more by François Rude (see Rude) and David d'Angers (see David d'Angers). In 1854 he won the *Grand Prix de Rome* with his fine statue of Hector and Astyanax. Carpeaux executed the sculptural decoration of the *Pavillon de Flore* at the Tuileries (Paris). His famous group of *La Danse* on the façade of the Grand Opera house (Paris) was placed in position in 1869. The *Fontaine de l'Observatoire* in the Luxembourg garden was exhibited in plaster at the Salon of 1872 and finished in bronze in 1874. The animals are by Frémict.

E. Chesneau, *Le Statuaire J. B. Carpeaux*; Paul Mantz, *Carpeaux* in *Gaz. d. Beaux Arts*, 1876; Jules Claretie, *Peintres et Sculpteurs Contemporains*, first series.

CARPENTER. A workman in wood; especially one who does the larger and rougher work, as of building construction, and as distinguished from a joiner and cabinetmaker.

CARPENTER, JOHN; bishop; b. 1476.

In the reign of Henry VI., John Carpenter, Bishop of Worcester, formerly president of Oriel College, was interested in the construction of S. Mary's church, Oxford, and was a principal benefactor of that work.

Pugin, *Specimens of Gothic Architecture*, Vol. II., p. 8.

CARPENTRY. The work of a carpenter. Also, the result of such work; building in wood, or woodwork in general. Carpentry is sometimes distinguished from Framing as referring rather to the smaller members of a building, as window frames, stairs, if not highly finished, flooring, and the like; it is distinguished from joinery and cabinetmaking as being rougher and dealing rather with the essential parts of a structure than the more decorative parts, without which the building might still exist.

CARPION (KARPION). (See Ictinus.)

CARR, JOHN; architect; b. May 15, 1723; d. Feb. 22, 1807.

Carr began as a mason, settled in York (England), and gradually acquired considerable reputation as an architect. He built the courthouse at York and a large number of fine residences in the neighbourhood of that city. He was twice lord mayor of York (1770 and 1785).

CARREFOUR. An open place from which a number of streets or avenues radiate. The proper signification of the French term is the place at the meeting of any streets, but in its English use the idea of the large open space is always retained.

CARRIAGE. A. An inclined beam or stringpiece for supporting a stair.

B. In a lumber mill, the movable framework which carries the log or plank and feeds it to the saw or plane.

CARRIAGE HOUSE. A building, or a part of one, for the shelter of wheeled vehicles when not in use; especially those of some elegance. Such a place is the almost universal accompaniment of a stable, and is usually arranged under the same roof with the stable proper. Sometimes, on a hillside, the carriage house is above and the stable on a lower level. Where space is not limited, or where great expense and display are proposed, carriage houses are sometimes separate buildings. The harness room is generally attached to it, as is a place for the washing of carriages and the like. (See Stable.)

CARRIAGE PORCH. A deep and broad porch into or through which a carriage may be driven, permitting its occupants to dismount under cover. Before public buildings in cities they are commonly constructed of iron and glass; in the country they are of wood or stone according to circumstances. Often miscalled in the United States Porte-cochère. (See Marquise.) — A. D. F. H.

CARRY UP. To build up vertically, as a wall, and distinguished from extending such a wall or other structure horizontally. Thus a building law may limit the height to which side walls may be carried up in advance of and independently of the front wall; and a contract may specify that the whole wall shall be carried up of a uniform thickness. — A. D. F. H.

CARTER, JOHN; architectural draughtsman; b. June 22, 1748 (in Ireland); d. Sept. 8, 1817.

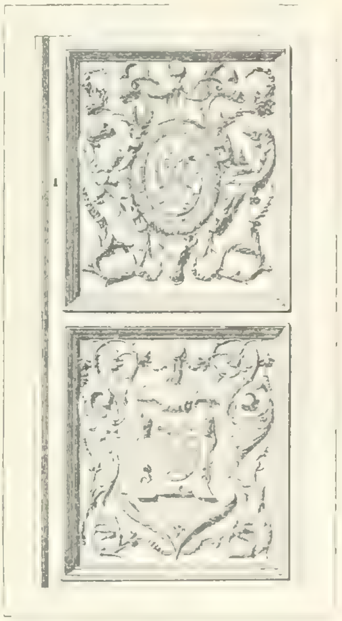
Carter illustrated Richard Gough's *Sepulchral Monuments* and *History of Croyland Abbey* and published *Specimens of Ancient Sculpture and Painting now remaining in England* (2 vols., folio, 1780, etc.).

Redgrave, *Dictionary of Artists*; *Avery Architectural Library Catalogue*.

CARTON PIERRE. A solid material for building purposes, wall decoration, and the like; a variety of *papier-maché* especially intended to imitate stone carving.

CARTOON. A drawing or transfer of a drawing upon a large sheet or sheets of paper; especially in Fresco Painting, Fresco Secco, Mural-Painting of other kinds, in Mosaic and in ornamental glass work (see Window), the outline in full size more or less filled in with the details of drapery or the like, which is used in the actual preparation of the final painting, mosaic, etc., either by exact copying or by tracing or pouncing.

CARTOUCHE. *A.* An ornament which, like an escutcheon, a shield, or an oval or oblong panel, has the central part plain to receive armorial bearings, a cipher, an inscription, or an ornamental or significant piece of painting or sculpture. Frequent in French Renaissance and modern architecture. The term in French denotes such compartments of any shape and filled with any decoration, and is nearly equivalent to Medallion, used in an architectural sense. In English the late neoclassic device of a slightly convex surface, circular or oval in form, is most commonly referred to as a cartouche.



CARTOUCHE: CARVING IN WOOD, CHÂTEAU D'ANET.

B. An oblong figure with rounded ends, enclosing the hieroglyphics of a royal or divine name, on Egyptian monuments.

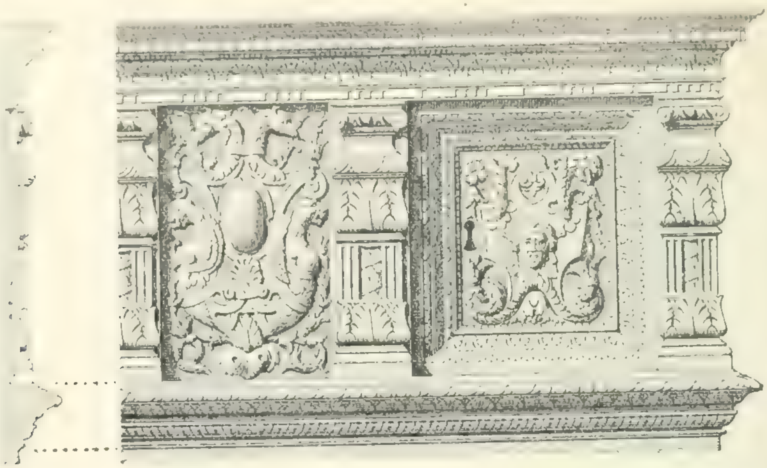
CARVING. *A.* Cutting in wood, stone, or other resistant material requiring the use of a sharp tool; especially, ornamental cutting, whether in relief or in intaglio. The distinction between carving and sculpture is wholly that of importance and dignity; thus, the figure subjects in Gothic work are hardly ever spoken of as carving, whereas the leaf ornaments in bands and cornices are often so designated. (See, for the treatment of the whole subject, Sculpture.)

B. A work or piece of sculpture as described in *A.* — R. S. (Cut, cols. 459, 460.)

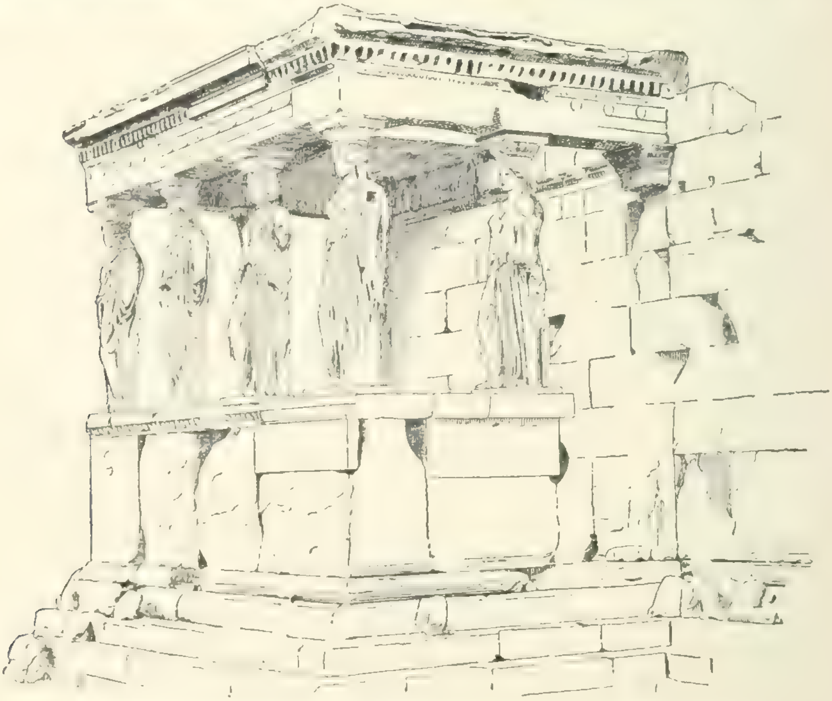
CARYATIC (adj.). Of, or pertaining to, or resembling, Caryatides. A caryatic order is a caryatid with the entablature it supports.

CARYATID (pl. Caryatids or Caryatides). A sculptured female figure used as a supporting member, in place of a column, or the like. Vitruvius (I. 1) speaks of them as somewhat common, "those female figures represented with a mutulus and cornice" (Gwilt's translation), but only a very few instances are known [illegible] work. Much the most important instance is that of the porch called Pandrosium, forming part of the Erechtheum at Athens. The caryatids here are free; that is to say, they take the place of columns; others are backed up by pilaster-like piers, such as the one in the British Museum, which was found near the Appian Way in the last century, its original position not being known. The Incantada at Thessalonica had caryatids in its attic; some of these are now in the Louvre. (For male figures discharging the same office, see Atlas; Telamon; see also Persian Order, under Order.)

CASA. In Italian architecture, a house, or in modern usage, a building of almost any sort, even applied to a large, new business building of many stories. In Venetia, corresponding very nearly with *palazzo* as used elsewhere in Italy, as applied to large private houses. (See Ca'.)



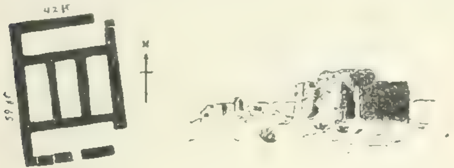
Carving: Panel from the Cluny Museum.



Caryatid Porch (so-called), South Side of Erechtheum, Athens.

CASA GRANDE. An ancient ruin in Arizona, near Florence. It is the only one remaining of numerous like structures, now shapeless mounds, that stood in an area of about sixty-five acres. It was long believed to be the Chichilticalli of Coronado's expedition of 1540, but latterly this opinion has been completely abandoned. The first recorded visit was made by Father Kino (Kuehne) in 1694, and it was then a ruin. The earliest description is by Captain Mange, who accompanied Father Kino on a second visit in 1697. He states that the central part was of four stories, and the remainder of three; and also mentions twelve other buildings, half destroyed, the roofs having been burned. Three stories only are now determinable at the highest central portion. That it is the work of American Indians of the Pueblo type is certain. By Bandelier it has been ascribed to the stock from which the present Pimas are descended.

The Casa Grande was a communal dwelling. The dimensions on the ground are about 43 by 59 feet. Partitions 3 or 4 feet thick separate the interior into five divisions, one at each end running transversely and wholly across the edifice, and three occupying the middle, parallel with each other and with the length of the building. The end divisions are about 10 by 35 feet, and the middle ones about 9½ by 25 feet each. Doors connected the rooms on each floor, and there were other apertures. The tops of the walls are still approximately level, and the outer ones are 3½ to 4½ feet thick at the bottom; while at the top all are about 2 feet thick, the reduction having been accomplished by interior setbacks at floor levels and by exterior batter. The outside is rough, but the inner wall surfaces are generally quite smooth. Floor joists were 3 or 4 inches in diameter, as shown by the impressions left in the walls, where also are impressions of smaller poles and reeds. The walls are formed of large blocks of adobe clay almost as hard as sandstone while dry, and therefore exceedingly durable in the arid region where they stand. (See Cajon.) Modern vandalism has done more to destroy Casa Grande than time, but the United States government has repaired it and made a reservation there. It is possible that there may have been a story of jacál construction. Floors, roofs, and other finish were essentially the same, as far as can be determined, as the ordinary Pueblo style, the manner of constructing the walls being the chief difference between this and many Indian houses now occupied. (See Communal Dwelling; Jacál; Pisé.)



Casa Grande: Ground Plan and Sketch of Walls.

Bandelier, Report, Part II.; *Bureau Eth. Rep.*, 13 and 15; Fewkes, *Journal of Am. Eth.*, Vol. II.
— F. S. D.

CASAS GRANDES. An ancient ruin in Chihuahua, Mexico, near the modern village of the same name. It comprises the best preserved, and probably largest, of a number of groups lying in the wild country round about. Numerous houses were of one or two stories, but others were as high as five stories. Many walls are still standing which vary in thickness from 16 inches to 4 feet, and in places reach a height of 35 feet. The construction is similar to that of Casa Grande and other ruins of the Gila Valley in Arizona, — that is, rammed adobe clay. The rooms are larger than are found in ruins in the north of Arizona and New Mexico. Doorways were large, and the apertures that were probably windows were sometimes round or oval, sometimes rectangular. Lintels were of wood about 6 inches thick. Upper floors and the roofs were of beams 5 to 7 inches in diameter, covered with poles and earth in a manner similar to all Pueblo roof architecture. Narrow streets separated the various groups of buildings. Some houses may have been set aside — as in the towns farther south — as religious structures or for other uses, but the majority were doubtless communal dwellings. The builders and occupants were Indians of the Pueblo type, probably closely allied to those who erected the buildings of the Gila Valley, though apparently somewhat farther advanced in culture. Bandelier estimates the former population of Casas Grandes at about 4000. — F. S. Dellenbaugh.

CASCADE. In the architectural sense, an artificial waterfall so arranged as to form part of an architectural or decorative composition. The most important example is that in the garden of the Royal Palace, at Caserta, near Naples. (See Château d'Eau.)

CASCALLES, JAIME; architect and sculptor.

Cascalles made, about 1366, in the chapel of S. Benito, at the monastery of Polbet (Ciudad Real, Spain), the monuments of the children of Don Pedro IV., King of Aragon. Some interesting fragments remain.

Viñaza, *Adiciones al Diccionario* [illegible].

CASE. *A.* A box, enclosure, or hollow receptacle, as the space in which a stairway is built: a staircase.

B. Same as Casing.

C. The carcass or structural framework of a house or other building. (Rare in United States.)

Door Case. A frame consisting of jamb pieces and lintel or head framed or nailed together. [illegible] and in which it closes; that face of the frame or case having a rebate so that the door when closed into the rebate shall be flush with the wall, or in a plane parallel with the face of the wall. In thin walls and partitions the case is as thick as the partition, and finished with a trim on either side the latter. In thick walls the case finishes with a trim on one side, and a backband moulding against the masonry or plastered portion on the other.

CASE BAY. Any one division of a roof or floor comprising two principals (rafters or girders), and the purlins or joists between them, except that next the end wall or gable, called the tail-bay, in which one end of the purlins or joists is carried by the wall. (See Bay.)

CASEIN PAINTING; CASEINE PAINTING. Painting with the use of casein, one of the constituents of milk, which combines chemically with quicklime. This combination can be diluted with water, and, when dry, is very hard and insoluble. It follows, then, that this medium can be employed on freshly plastered walls. It can also be used on dry plaster. Casein is prepared from cheese by trituration, but even fresh white cheese may be used instead of pure casein without further treatment. To prepare the pigments, first stir up three parts of cheese and one of fat slaked lime. The quantity of colour to be added must be learned by experience. Earth colours and metallic oxides should be used, and for white, oxide of zinc or sulphite of baryta, or whiting. The medium must be freshly prepared every day, and this is probably the reason why the use of it is infrequent. Even the small amount of casein to be found in milk unmixed with quicklime makes it an excellent medium, more or less insoluble. The Italians use it as a medium both on fresh and dry plaster, preferably on the former. (See Tempera.)

Frederic Crowninshield.

CASEMATE. *A.* In fortification, a vaulted and supposed bombproof chamber, intended to contain a gun, and having therefor an embrasure in the outer wall. The seacoast "castles" built between 1800 and 1865 were planned with as many as three stories of casemates, and with a barbette platform on the summit. Modern fortification tends to abandon the use of this.

B. Same as Casement, *C*; an erroneous term.

CASEMENT. *A.* A window having hinged or pivoted sash, opening either outward or inward. In North Germany many such windows open outward, and this is preferred, except where it is desired to put up secondary or outer fixed sash (forming "double windows") in winter. English country houses were commonly fitted with light iron sash in very small casements. These also opened outward, and were held by long hooks or some other form of sash-holder. This fashion has been revived of late. (See French Casement below.)

B. One leaf or swinging frame forming part of such a window, and thus in British usage distinguished from a sash. In the United States, usually called casement sash.

C. In mediæval architecture, a deep, hollow moulding similar to the scotia of classic architecture.

French Casement. A casement having two meeting hinged leaves opening inward, secured usually when closed by an Espagnolette. This is almost the only form of window used in France, and is common throughout Europe. The difficulty of making such casements tight against driving storms is overcome in France by careful workmanship. The meeting rails form a large semicircular tongue and groove, forced tightly one into the other by closing. The sill joint is protected either by a drip moulding on the bottom rails overhanging the edge of the wooden stool, or by a hinged brass drip, which, on closing the window, folds down over the stool. In the United States French casements are chiefly used to give access to balconies or verandas. (Called often French Window.)

CASERNE. A barrack for troops — a building for the lodging of soldiers. The French term, rare in English; it is used, however, for those buildings of great architectural pretensions which are not uncommon in the cities of the Continent. Of these one of the most noted is that facing the *Champs de Mars*, in Paris, which was built in the reign of Louis XV. as a military school, and several others of the eighteenth century. Also, the *Caserne Napoléon* and the *Caserne Prince-Eugène,* both built during the Second Empire.

CASHEL. In Irish archæology, an enclosing wall of rough stone, intended either for defence as forming part of a rude fort, or enclosing a church or several sacred buildings. By some writers the term has been adopted for general use as meaning an enclosure of rough stonework.

CASING. In general, the exterior covering of a structure or member of a structure; a shell or boxing of some superior material, as the mahogany casing of a ceiling beam. Specifically, in the United States the boxing or frame about an opening — that portion which is parallel to the general surrounding surface, and therefore usually at right angles to the jambs. It may be structural, as those parts which form the inside and the outside of a cased frame (see Frame; Lining), or decorative, as the trim or architrave of a door.

CASINO. (Italian diminutive, "little house," from Casa.)

A. In the Italian sense, a pleasure house in a garden, or in the grounds of a villa, usually devoted to purposes of recreation and perhaps used to store works of art, as the casino of the Villa Borghese, or of the Vigna Papa Giulio, at Rome. Sometimes used also for residence.

B. Hence, a building for recreation belonging to a club, or connected with a spa, watering-place, or like public resort — *e.g.* that at Monte Carlo, or, in the United States, at Newport and Narragansett Pier. A casino in this sense is provided with music rooms, café and restaurant, rooms for cards and other games, smoking and conversation rooms, billiard room, verandas, and ornamental grounds. The building is usually large and complex; the term therefore is unfortunate.

C. In English and American usage at different epochs a dwelling house whose design affects the one-storied look of *A*. In the United States, before 1850, several such buildings were put up two or three stories high, but having at least one front which pretended to be of a single ground story only.

— A. D. F. H.

CASPAR, ADAM. (See Caspar, Eugenius.)

CASPAR (CASPARINI), EUGENIUS; organ builder.

The Casparini were a famous family of organ builders in the seventeenth century. Eugenius, born at Sorau (Prussia), was the son of an organ builder. After working in Bavaria he went in 1644 to Italy and lived for many years in Padua. In 1694 he was called to Vienna. In 1697 he built the great organ in the church of S. Peter and S. Paul at Görlitz in Silesia, which was finished in 1704. This organ, the most famous work of Eugenius, is described by several authors. He built organs also for the churches of S. Giustina at Padua, of S. Georgio Maggiore at Venice, for the imperial palace at Vienna, and elsewhere. Eugenius was assisted by his son Adam. Adam's son, Johann Gottlob, was also an organ builder.

Allgemeine Deutsche Biographie.

CASPAR, JOHANN GOTTLOB. (See Caspar, Eugenius.)

CASSOON. A deep ceiling panel, a caisson or coffer. (Rare.)

CAST. A reproduction of the forms of any object, usually in a soft material which will harden after a time. The cast first taken, as of a bas-relief, a moulding, or the like, is usually called the mould; and is, of course, the reverse of the original. That which is taken from the mould will, of course, be an exact copy of the original object. It is common to make casts in plaster and in sulphur, the latter having the great advantage that it does not shrink in setting; and moulds of bas-reliefs and the like are made of gelatine, which is capable of easy manipulation. The second cast, or reproduction of the original object, is most commonly of Plaster of Paris, and the study of architecture has been largely aided by the use of such casts of architectural detail. The eastern wing of the Trocadéro Palace in Paris is occupied by a collection of such casts, made with great care to facilitate the comparison of the sculptured and architectural detail of the different periods. Of pure sculpture, the largest collection of casts in the world is that at Berlin, and large ones exist in Dresden, Vienna, the South Kensington Museum in London, and in many other museums in Europe and the United States; but of architectural details few considerable collections exist; besides that at the Trocadéro there is one at the South Kensington Museum, and one at the Metropolitan Museum of Art in New York. Many architects have some casts in their offices, these being more usually pieces of ornament in low relief or the like, things which are easy of distribution; but it is evident that the detail loses its chief value when removed from its surroundings and from the other details which go to make up a complete whole. It is, therefore, of peculiar importance that collections should be made of pieces as large as practicable of the original structure. Thus, if a whole doorway with its sculptures, or a fifteenth century Italian pulpit complete in all its parts can be set up in plaster, it will be of more use to the student than many smaller fragments, however carefully chosen and perfectly made.

Casts of sculpture or of architectural detail should always be coloured in close imitation of the colour of the original; because the forms which are appropriate for white or very light material may not be fit for work executed in a dark substance. Difficulty arises when the colour of the original is variegated. Thus, a diorite statue from Egypt would be hard to imitate in its colour; but no such difficulty exists in the case of statues or decorative work in basalt, bronze, red marble, or the like. If for any reason it is desired to set up in a gallery the absolutely unaltered cast as it leaves the mould, with all its seams and ridges unremoved, another should be prepared, carefully finished by skilful and conscientious hands, and coloured in close imitation of the original; this finishing being done, of course, in the presence of the original and before the cast is delivered to the purchaser. Another use of casts is in the carrying out of proposed restoration. Modern archæological feeling prohibits such restorations as were freely made as late as 1820, even in such important and carefully considered works of ancient art as the Ægina sculptures at Munich, and this is well; but there is nothing to prevent the carrying out in plaster of proposed or suggested schemes of completing a statue, a bas-relief, or an architectural detail. A slight beginning has been made at such work as this, especially in the Royal Gallery at Dresden.

— R. S.

CASTELL, ROBERT; architect.

Castell published, under the patronage of Lord Burlington (see Boyle, Richard), the *Villas of the Ancients*. He is supposed to be identical with the Castell whose sufferings and death in the Fleet Prison in 1729 are described by J. T. Smith (op. cit.).

J. T. Smith, *An Antiquarian Ramble in the Streets of London*; Castell, *Villas of the Ancients*.

CASTELLAMONTE, AMADEO CONTE DI; architect.

An architect of the school of Pellegrino and Domenico Tibaldi (see Tibaldi). He entered the service of Carlo Emmanuele II., Duke of Savoy (1634–1675), and for him planned the *Piazza di S. Carlo* (1638), the *Palazzo Reale* (begun 1646), and the *Ospedale Maggiore* (1675), all at Turin (Italy). For the duke also he built the hunting seat and park near Turin called *Veneria Reale* (now destroyed). Castellamonte published a description of his park in the form of a dialogue entitled *Veneria Reale* (Turin, 1674, folio).

Gurlitt, *Geschichte des Barockstiles in Italien*.

CASTELLATE; –ED (adj.). *A*. Provided or formed with castellations; having embattled parapets consisting of merlons and crenelles or embrasures.

B. Resembling a castle, or made to resemble one in appearance. (See Castle; Crenelle; Embrasure; Parapet; etc.)

CASTELLET. A small castle. The English form of the French *Châtelet*; rare. (Written also Castelet and Castlet.)

CASTELLI, FRANCESCO. (See Borromino, Francesco.)

CASTELLUM. *A*. In Roman archæology, a small fortified post, as at a point on a wall of defence. Thus, along the wall between the Roman province of Britain and the unconquered north of Scotland there was a castellum to every mile and a half on the average of the whole distance (nineteen forts in a length of twenty-seven miles). Other castelli were much larger, and the term seems to have been extended to fortresses of considerable size. The term was perhaps most commonly used as meaning a fortress which was nothing else, rather than a walled and fortified town.

B. Also, according to some writers, — as Vitruvius, — a distributing reservoir connected with a Roman aqueduct, the full title being then Castellum Aquarum. — R. S.

CASTEL S. ANGELO. The Mausoleum of Hadrian as altered by the addition, in the Middle Ages, of a superstructure replacing the conical roof, and providing at the same time means of defence against a sudden attack, and a number of chambers for the residence of the Pope and his followers. The building was used as a citadel, and the means of escape thither from the Vatican were made easy. It connects with the Vatican by a private passage. (See Corridor.)

CASTILLE, COLIN (NICOLAS); carpenter (*maître menuisier*).

Dec. 30, 1507, he contracted to execute all the fine woodwork (*menuiserie*) of the château of Gaillon, near Rouen. Colin finished the doors of the cathedral of Rouen, Seine Inférieure, France, and in 1514 made a design for the central spire which was not executed. (See Becquet, Robert.) In 1518 he was called upon to build the organ loft (*buffet d'orgues*) at the church of S. Maclou at Rouen. The last payment for his work was made in 1521.

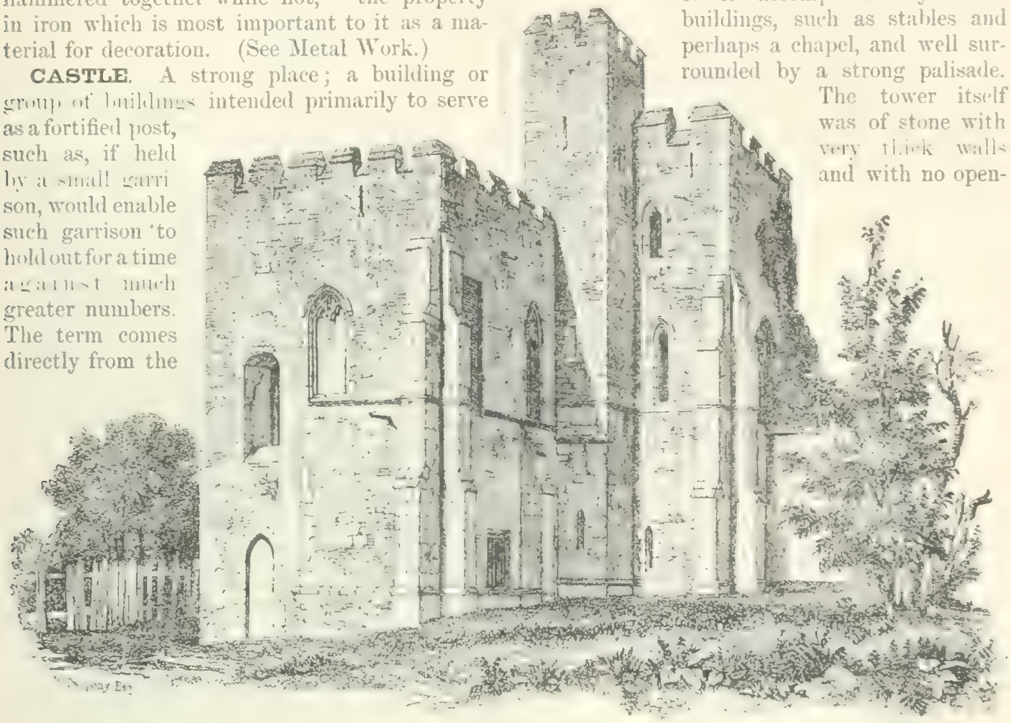
Deville, *Comptes de Gaillon*; Deville, *Revue des Architectes de la Cathédrale de Rouen*; Abbé Cochet, *L'Orgue de Saint-Maclou* in *Bulletin Monumental*, Vol. XIX.

CASTING. *A*. The art and act of making casts.

B. Anything cast, whether of metal or other material, which has been melted and run into a mould; or of plaster, cement, or the like, mixed with water, which has been allowed to set in a mould. (For a casting of plaster or similar soft material, see Cast.) Castings of bronze, brass, and zinc and the like are much used in the industrial arts, cast bronze having been peculiarly the metal for fine art objects in use from time immemorial. It is usual to finish castings after they leave the mould; and this is done with fine tools, files, and the like, and should be done by the artist himself who has made the original model. When a mould is made for casting, it must be so shaped that the hardened metal or other substance will leave the mould rightly, and will not tear it by breaking its particles away. For this reason the forms which are capable of being produced in an original casting are limited in their character, and the design for a casting must be different from that which is to be wrought by hammered work or in other ways. On these accounts, cast iron, being much too hard for successful finishing by hand, is hardly fit for delicate ornamentation; and yet the Berlin iron work, originating in a patriotic movement in 1813, has much charm. Medals of bronze, silver, and the like are more often struck by a die, but are sometimes cast; and the beautiful large medals (medallions) of the Renaissance are generally cast bas-reliefs of bronze. — R. S.

CAST IRON. Iron which is shaped by being run into a mould while melted, as described under casting. In ordinary commercial usage a compound of iron and carbon; the material which runs directly in liquid form from the blast furnace, and which hardens in the mould. From cast iron is made the purer iron which is used for working with the hammer, and also steel. Cast iron is brittle and hard, and is not capable of being welded, that is to say, of having two parts united when hammered together while hot, — the property in iron which is most important to it as a material for decoration. (See Metal Work.)

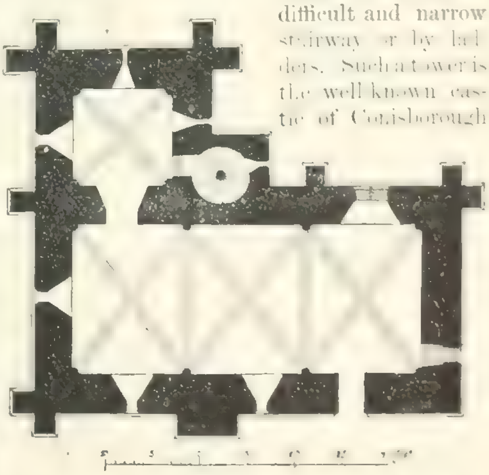
CASTLE. A strong place; a building or group of buildings intended primarily to serve as a fortified post, such as, if held by a small garrison, would enable such garrison 'to hold out for a time against much greater numbers. The term comes directly from the Latin *castellum*, which signified generally a fortified post on a Roman wall, or forming one of a chain of such posts. In mediæval practice, however, each stronghold was independent of its neighbours, because in most cases it was the only strong place held by a baron or other feudal tenant of lands. In this connection it came to mean the principal residence of such a feudal holder, and is in later times confused with Manor house exactly as in French the term *Château* is confused with *Manoir*.



Castle, Little Wenham Hall, Suffolk; 13th Century. (See Plan.)

Some strong castles were, however, held by occupants in the immediate service of the king or of a great vassal. Thus, in the struggles of the great vassals against the crown of France and in England in the reigns of John, of Henry III. and of Edward II., many castles became merely fortresses, without having the character of a manor house even in the smallest degree. Such castles would naturally be built in strong and defensible positions or at points valuable as commanding a road, a water course, or the like. The character of the building, however, is practically the same throughout Western Europe at any given period, the changes in the system of defence coming slowly but almost simultaneously throughout all the lands of Northwestern Europe.

A castle of the earliest type, as of the eleventh century, may be considered as a single strong tower accompanied by minor buildings, such as stables and perhaps a chapel, and well surrounded by a strong palisade. The tower itself was of stone with very thick walls and with no openings below the third or fourth story except the door, and this door placed high above the surrounding level of the ground and to be reached only by a difficult and narrow stairway or by ladders. Such a tower is the well known castle of Conisborough in Yorkshire, which was one of the largest fortresses of this early time (circa 1100). Such a tower would contain but one chamber in each story, although a small oratory, closet, or private



Castle: Plan of Little Wenham Hall, Suffolk.

[illegible] might be opened in the thickness of the wall or in one of the great buttresses in some [illegible]

The castle of the time of Philip Augustus of France and Richard I. of England is well illustrated by the strong post of Château Gaillard at the Andelys in Normandy. This fortress has been explained and illustrated by Viollet-le-Duc in the *Dictionary of Architecture*, s. v. *Château*, *Donjon*, *Siège*. Although special military and engineering skill may have been shown in this work, the arrangement of the buildings and the amount of space enclosed, the number of buildings included in the group, etc., may all be considered as typical. The writer cited has well pointed out that in the fortresses of this early time every separate tower was constructed as a strong post and arranged for long-continued defence, but that communication between tower and tower was purposely slow. When one of these was mined or taken by escalade the little garrison would be cut to pieces before it could escape to another part of the work. This fault was remedied at a later period, and the castles of the fourteenth century are most carefully combined into a single position of defence. Of these castles one of the most formidable seems to have been the castle of Coucy (Aisne) in northern France. This also has been well described in the work above cited, and these plans should be compared with the other elaborate fortresses erected by the Christians in Syria after the foundation of the Latin kingdom of Jerusalem. For these, and for the minor castles of the earlier period, see the *Handbuch der Architektur*, Part II, Vol. 4, 1st Division, "Die Kriegsbaukunst." The culmination of the mediaeval military architecture is to be found in the castle of Pierrefonds, northwest of Paris, which has been restored by Viollet-le-Duc. In this all the defence of the castle is carried on from a chemin-de-ronde, which is an almost wholly continuous gallery carried around the outer walls and at a height of some 120 feet above the bottom of the ditch. Secondary chemins-de-ronde are carried along the walls and around the towers at a still greater height. The keep itself forms a part of the defences, and, while capable of holding out if the enemy should have gained a lodgment in the courtyards or in other towers, is much less detached from the rest of the work than would have been the case at an earlier epoch.

The system of defence in all these castles is the same, however. Arrows, bolts from crossbows and stones dropped from a projecting gallery of defence (see Machicolation) were the chief active means of defence, and great height was given to the walls in order to increase the violence of the blow of a descending heavy missile, such as a rounded stone. The passive resistance was afforded by the rocky site which made mining almost impracticable, or by the very deep ditches surrounding the work, which compelled the assailant to attack the rock itself beneath the ditch, and, finally, by the excellent masonry of the walls, often forming one solid mass, without open rooms within, for a considerable height. The attack and defence, therefore, were mainly vertical, and we are to remember that the besieger might encamp close to the walls and still be out of reach of most of the missiles of the besieged. There remain, however, to be considered the military engines which threw large stones and great beams of wood pointed and shod with iron, and also, in some cases, barrels or crates of inflammable materials. The range of these engines was not very great, however, nor does it appear that the success or failure of an attack was generally

Castle at Coca, near Segovia, Spain, 15th Century.

dependent upon these in a very large measure. Escalade was resorted to in the case of a sudden surprise; but when the castle was prepared for defence by means of wooden galleries, as described under Machicolation, this method could hardly be used. Wooden towers, carried on wheels and protected from fire by rawhides or other incombustible substances, were rolled up to the walls, and from their tops bridges were dropped, enabling the besiegers to rush upon the chemins-de ronde in considerable numbers. This must be considered as a variety of escalade, and could not be applied until the wooden galleries of defence were nearly demolished.

A castle of the Middle Ages must be considered not only as a fortified post, but also as a place of residence for a number of persons. As regards the dwelling of the lord and his family, this was simple, consisting of very few rooms, perhaps one large bedroom and two or three very small appendages. To a great extent the meals were taken in common with the permanent garrison, that is to say, the lord and his permanent force of retainers took their meals together in the largest hall which the castle afforded; and the lord's family would be present at such meals except in rare cases. Nothing in the nature of sitting rooms or parlours existed, except as the lady of the castle might have a solar or bower. (See Hall; House; Manor House; Schloss; and the definitions of the terms used in this article.)

For military architecture of the Middle Ages see Viollet-le-Duc's *Dictionnaire*, articles *Château*; *Donjon*; *Siège*; and *Tour*; also Salvisberg, *Die Deutsche Kriegs-Architektur*. The English books on castles and the like are more commonly treatises on the modern country houses of England and picturesque ruins, than an examination of the principles of fortification. — R. S.

CASTLE OF ASIA; CASTLE OF EUROPE. Two ancient fortresses on the Dardanelles (Bosphorus) called also the Castles of the Dardanelles, and built by Mohammed II., who captured Constantinople in 1453. That on the Asiatic side has been altered and mounted with modern guns.

CASTLE HOWARD. A great country house and park in Yorkshire, England, built in 1702 from the designs of Sir John Vanbrugh.

CASTLE RISING. Near King's Lynn, Norfolkshire. A ruined castle of which the keep is of great antiquity, being considered of the pre-Gothic or so-called Norman epoch. Besides this, the chapel and the gatehouse at a little distance are in such condition that they can be studied. No excavation or archæological examination has been made.

CATABASION. A reliquary or recess for relics under the altar in a Greek church.

CATACOMB. In architecture, an underground cavern, usually wholly artificial in character, or enlarged and shaped by art, and used for the burial of the dead. The catacombs best known and most frequently cited for their tombs and for the mural paintings and relics which have been discovered in them are those of Italy; but they exist in Cyrene, in Alexandria, and the Island of Melos, in the Grecian archipelago, and also in many parts of Sicily, as well as in Paris, where they occupy chambers excavated in the process of quarrying the soft limestone of the Paris basin. There is no absolute distinction between the Columbarium of pagan times in and near Rome and the catacombs which we associate with Christian burial; but a distinction may usually be made, based upon the more limited and exact boundaries of the *columbaria*, they being circular or nearly so, and surrounded on every side with the chambers for funeral urns, while the catacombs wander without apparent method in the form of long galleries at different levels, crossing each other at irregular angles, and giving out at unequal distances small burial chambers, or even small galleries without issue, which themselves give off burial chambers. The catacombs near the Via Nomentana, and those of S. Calixtus at Rome, are perhaps the best known. These are in the immediate neighbourhood of Rome.

Many works have been devoted to the study of the catacombs, of which the most notable are G. B. de Rossi's *La Roma Sotterranea Christiana*, three volumes, 1864–1877. This, however, is limited to the catacombs of Rome, while much the most important treatment of the subject has been hitherto limited to the pages of periodicals and reports of societies. A valuable book of moderate size is that by Victor Schultze, *Die Katakomben*, published at Leipzig, 1882, and which gives a critical account of the large and costly works which have been devoted to the subject, in addition to an analytical history of the catacombs themselves.

CATACUMBA. *A.* A Catacomb, the Low Latin form of the word.

B. The courtyard or atrium preceding a Christian basilica.

CATAFALQUE. A temporary structure comprising a scaffold or platform and a canopy, the whole either stationary or on wheels, for the reception or public display of the remains or effigy of a deceased person, as for the funeral procession or ceremonies and "lying in state" of a personage of distinction.

CATBAND. In the North of England, —

A. A chain for closing a street.

B. A bar for securing a door on the outside.

CATCH. A contrivance for automatically securing a door, shutter, or a similar movable leaf by the action of gravity or of a spring. In some of its more elaborate forms hardly to be distinguished from a latch or spring lock. (See Latch; Lock.)

CATHAIR. Same as Caer.

CATHEDRA. The official seat or throne of the bishop in a church. At Torcello, near Venice, is the only existing example of the ancient seating of the clergy in tiers around the apse; the cathedra of marble occupies the centre, and is raised high above the other seats, with a flight of steps leading to it. Ancient bishops' chairs of stone in their ancient place, at the rear of the apse, exist in the basilicas of S. Clemente and S. Lorenzo, at Rome; and a Romanesque stone cathedra is in the western apse of Augsburg cathedral. (See Bishop's Throne.)

CATHEDRAL (adj.). Having to do with the chair or throne (*i.e.* of a bishop).

CATHEDRAL (n.) (more properly Cathedral Church). The church in which is set up the Bishop's Throne or Cathedra. This church may be considered as the bishop's Throne Room; or, if the Choir be considered as the throne room, then the cathedral with Chapter House and other accessories, and the actual residence of the bishop, together with the Cloisters and other enclosed spaces, may be considered as the Episcopal Palace, resembling a royal or grand ducal palace in having rooms for business and ceremony combined in the same building with the residence of the prince and his officers and attendants. The cathedral itself is not necessarily large nor splendid, nor is there any architectural style or character which can be said to belong to it in a peculiar sense. In Athens, the old cathedral, which was used without interruption until the middle of the present century, remains one of the smallest churches in the world, and capable of containing a congregation of only a few score. The cathedral of that part of Venetia in which is situated the city of Venice was, for many years, a small and unimportant church, S. Pietro in Castello, situated on a remote island; and the church of S. Marco, built and used as the chapel of the Doge, was made the cathedral after the destruction of the Venetian Republic. In England, Saint Albans Abbey church, a Romanesque building of importance, having been preserved after the destruction of the monastery building (exactly as has been the case with Westminster Abbey), has recently been raised to the dignity of a cathedral; that is to say, a new see was established with its centre in the town and church of Saint Albans. The largest church in Christendom, S. Peter's, at Rome, is not a cathedral; the cathedral of the Bishop of Rome is the ancient Lateran Basilica.

Churches which have been cathedrals, and which have ceased to be so, as in consequence of the consolidation of two sees in one, sometimes retain the name in the popular language; and as they often keep their canons and their ecclesiastical officers, except the bishop, they receive the name Collegiate Church. On the other hand, the name cathedral is not always given with any general consent to buildings which have been raised to that rank; thus, Southwell Minster, which has been made the see of a bishop, is still called by its old name.

It appears, then, that from the architectural point of view the cathedral requires no separate treatment; it is to be considered as a church, to be compared with other churches. There is, however, a cause for the rapid building of cathedrals in the twelfth and thirteenth centuries, and of the great size and splendour given especially to these churches. This has been touched upon in the article Church Building; it is the communal or social character of the movement which united people of the towns with their bishop, and which resulted in the free using of large parts of the cathedrals, when finished, as places of popular resort. The historical use of old S. Paul's in London as a place for meeting friends, buying, selling, and engaging servants, and which lasted at least to Shakespeare's time, is an evidence of this; and its influence is still seen on the continent of Europe, where not only are the cathedrals open more or less continually to all comers, but even the public is allowed to pass across from door to door, thus making a short cut through the most important church of the town. Important cathedrals are mentioned in the summary under Church, and many are instanced in such articles as Gothic Architecture, Romanesque Architecture, and the essays on geographical divisions. — R. S.

CATHEDRAL CHURCH. (See under Church; see also Cathedral (n.).)

CATHERINE WHEEL. In England, a circular traceried window with radiating bars or mullions. (See Rose Window; Wheel Window, under Window; Gothic Architecture; Tracery.)

CATHUD. In Scotch usage, a large flat stone set upright to form the back of a fireplace at a distance from the wall behind it, so as to allow of a seat between the wall and fireback.

CAT STEP. Same as Crow Step.

CAT STONE. In Scottish archæology, an upright stone supposed to be erected in memory of a fight, and the name supposed to be derived from the "British Cad or the Gaelic Cath" (Wilson). These stones are often inscribed, sometimes in Roman characters, though it is not evident that these inscriptions are of the same date as the first placing of the stones. (Compare Bauta; Tumulus.)

CATTANEO, DANESE (DA CARRARA); architect, sculptor, and poet; b. about 1509; d. 1573.

He was established first in Rome, but went to Venice with Giacomo Sansovino (see Sansovino) after the sack of Rome in 1527. He assisted Sansovino at the Doge's palace, the Libreria di S. Marco, the loggia of the Campanile and the *Zecca* (mint). Cattaneo wrote a poem in twenty-four cantos entitled *L'Amor di Marfisa.*

Muntz, *Renaissance*.

CATT STONE. Same as Cat Stone.

CAUKING. Same as Caulking.

CAULICULUS. Literally a stalk. A Latin term applied technically to each of the eight stems which in the Corinthian capital spring from the interspaces of the second or upper row of acanthus leaves, and bear a branching pair of leaves forming a springing point for a pair of diverging scrolls or volutes. The term, though strictly referring only to the supporting stem, is frequently employed for the stem and scroll together. (See Corinthian Order. Written also Caulicolus and Caulecole.) —A. D. F. H.

CAULKING. *A*. The act or method of securing the end of a timber, like a girder or tie beam, to another on which it rests at right angles (as the wall plate or sill) by means of a cog hold.

B. The operation or method of rendering a joint tight, as against water or gas, by driving into its interstices with a chisel or other tool some plastic or elastic substance, as oakum and tar in the decks of ships, lead in the hubs of soil pipes, etc. (See Plumbing.)

C. In boiler work and hydraulic work a process for making a joint steam or water tight by upsetting the edges of the steel or iron plates. (Written also Calking, Cauking, Cocking, Cogging.)

CAUS (also **CAUX**), **SALOMON DE**; engineer, architect, and landscape architect; b. 1576; d. Feb. 27, 1626.

He probably derived his name from the *Pays de Caux* (littoral of the department of Seine Inférieure, France). He made a special study of mechanics and architecture, travelled extensively, and drifted to England where he became architect and engineer in ordinary to Henry, Prince of Wales. He was also drawing master to the Princess Elizabeth, and followed her to Heidelberg (Germany), where she married (April, 1612) the Elector Palatinate Friedrich V. Salomon laid out the great garden of the castle at Heidelberg, and probably made additions to the castle itself. He returned to France about 1620, and acquired the title *ingénieur et architecte du roi*. In his *Raisons des forces mouvantes* Salomon describes a machine for raising water by means of the expansive power of steam, thus taking the first step toward the invention of the steam engine. His principal works are *La Perspective avec la raison des ombres et miroirs* (London, 1611–1612, folio); *Institution Harmonique* (Heidelberg, 1614, folio); *Les Raisons des forces mouvantes* (Frankfurt, 1615); *Hortus Palatinus*, etc.

Léon Sagnet, Article *Caus* in *La Grande Encyclopédie*; Koch-Seitz, *Das Heidelberger Schloss*; Pfnor, *Monographie du Château de Heidelberg*.

CAVA, LA. (See Onofrio di la Cava.)

CAVÆDIUM. In Latin, an inner court, as of a dwelling house (cavum ædium); perhaps identical with the Atrium, when that had grown from the large sitting room, kitchen, etc., to a court of general communication, and often open to the sky, at least in part. There seems no sufficient reason for considering this term as in any way different from atrium in this later and larger sense. (Vitruvius, VI, 3.)

CAVALCANTI, ANDREA DI LAZZARO (called Il Buggiano); architect and sculptor; b. 1412; d. Feb. 21, 1462.

Cavalcanti was the foster son and principal heir of Brunellesco (Gaye, op. cit., Vol. 1, pp. 142–145). He made the water-basin in the sacristy of S. Maria del Fiore (Duomo, Florence). The monument to Brunellesco himself in the Duomo is his work, and the death mask of Brunellesco in the *Opera del Duomo* (Fabriczy, op. cit., p. 398).

Hans Stegmann, in *Die Architektur der Renaissance in Toscana*; Muntz, *Renaissance*, Vol. I. 1889; Fabriczy, *Filippo Brunelleschi*; Gaye, *Carteggio*.

CAVEA (pl. –Æ). In Roman archæology, a hollow place or building, in several senses.

A. One of the lowest tiers of vaulted cells under the seats of an amphitheatre, in which were confined the wild beasts destined for the show.

B. The whole seating space of a Greek theatre as being an excavated work, or more rarely of an amphitheatre as seeming to be so.

CAVE DWELLING. A natural cave occupied by men as a dwelling place. Caves have been so occupied in all ages. In Europe there are caves that were occupied long ago for an extended period; but in America, while numerous natural caves have been inhabited, the duration of the residence within them was comparatively short. Some caves were walled up in front, leaving only a doorway. Many of those existing in the Southwestern United States were very small, and were nothing more than storage vaults. In the huge cavelike recesses of the sandstone cliffs of the Southwest, houses and villages have been constructed by American Indians of the Pueblo type, and these structures are often described as cave dwellings, though they properly belong to the class "cliff dwellings." (See Cavate Lodge, under Lodge; Cliff Dwelling; Cliff Outlook; Communal Dwelling, etc.)

CAVE TEMPLE. A sacred shrine or place of worship excavated in the rock. The most important are those at Ellora, in the Dekkan, 200 miles northeast of Bombay. (See India; Kailas; Monolithic Architecture; Rock Cut Building.)

CAVETTO. A moulding having a simple concave profile, usually a quarter round, and thus distinguished from Scotia, whose profile is a concave curve the half of a circle or ellipse, or more. (See Moulding; Profile.) — A. D. F. H.

CAVIL. Same as Gavel.

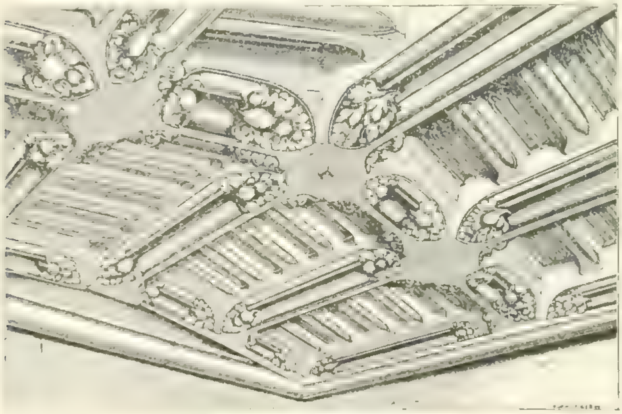
CAVO RILIEVO. (See Relief.)

CECROPIUM. A building or sacred spot at Athens, dedicated to or commemorative of Kekrops (Cecrops), the mythical founder of the city. The word is an adjective used absolutely, and means sometimes the Acropolis of Athens; sometimes some building upon it. Inscriptions speak of the kekropion or kekropeion, but their indication is not perfectly understood.

CEIL (v.). *A.* To sheathe internally; to line with plaster, boards, or other thin coating; especially, in the United States, with a thin sheathing of wood, usually in narrow matched and beaded strips.

B. To provide with a ceiling in sense *B*; to finish, with or without decoration, the horizontal surface forming the top of a room.

CEILING. *A.* The covering of a wall surface, especially on the interior; or of the under side of a floor; the material used being always supposed to be a simple and ordinary one. Thus, ceiling is of thin boards or of lath and plaster, but never of tile, nor is the term applied to the surface afforded by the solid material of a wall or floor; except as under *B*.



Ceiling of Carved Wood in Naworth Castle, Cumberland; 14th Century.

B. By extension from *A*, the under side of a floor which provides the roofing or enclosure at top of a room or other space below. In this case, it is the surface alone which is designated without reference to material. (Cuts, cols. 481, 482.) — R. S.

Beam Ceiling. A ceiling, generally of wood, made in imitation of exposed floor beams with the flooring showing between. Hence, sometimes, the under side of a floor, showing the actual beams, and finished to form a ceiling.

CELATURE. The art of decorating metals by chasing, engraving, or *repoussé* work.

CELER; architect.

Celer and Severus are mentioned by Tacitus (*Annales*, XV., 42) as the principal architects employed by Nero (emperor 58 to 68 A.D.) in his immense architectural undertakings. The chief of these was the great palace called the Golden House. The following inscription is found on an antique capital in the church of S. Agnese fuori le Mura at Rome: —

CELERI
NERONIS
AVGVSTI. L.
A[RCHITECT]O.

Brunn, *Geschichte der Griechischen Künstler.*

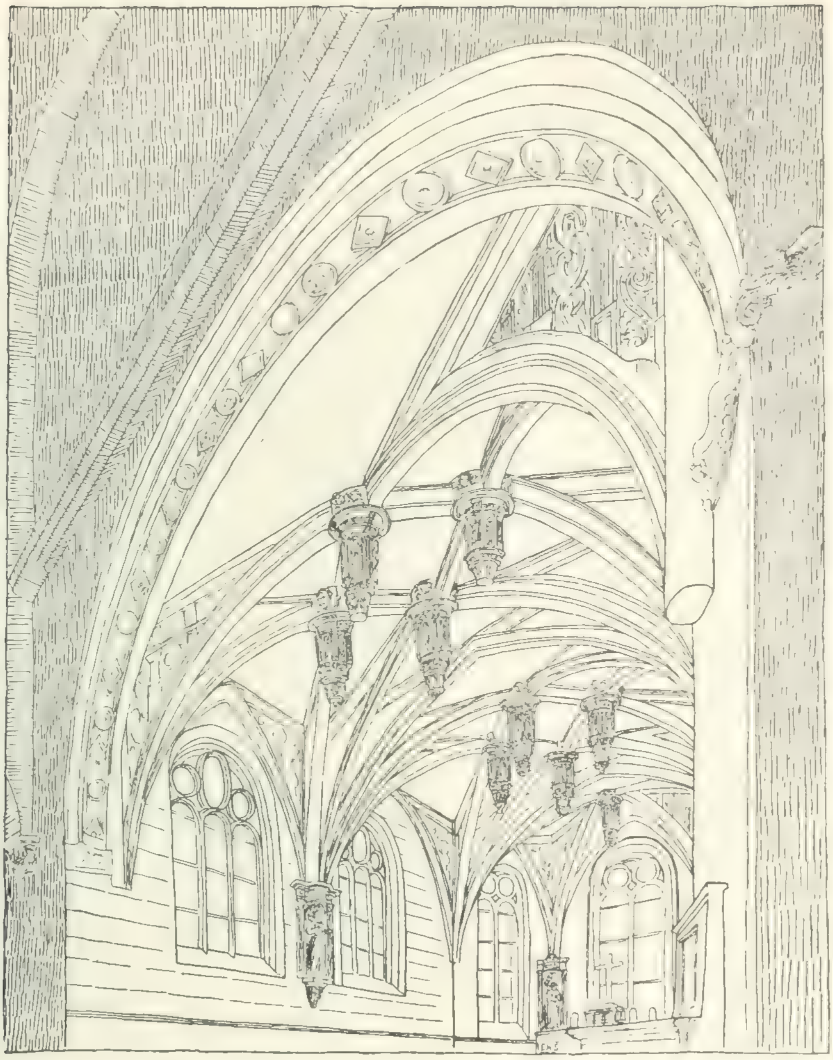
CELL. *A.* A small apartment of any sort; especially the sleeping room allotted to a monk or nun in certain religious orders, or the room, generally for one person, in a prison. In the Carthusian order the cell may consist of more than one room, as the rule of this order involves nearly solitary life, but not necessarily a very ascetic one. A sleeping closet and a small study are commonly components of a Carthusian cell, and a small garden should be in communication with the study.

B. (As used in an electric battery, see Voltaic Cell under Electric Appliances.)

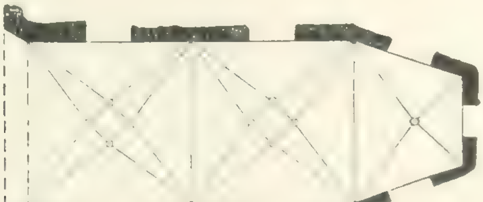
CELLA. In Latin, a chamber, a small room; rarely so used in English, but see account of Harpy Tomb in article Asia Minor. Hence, in Latin and in English usage, the enclosed part of a Greek or Greco-Roman temple, including the sacred chamber itself and the entrance vestibule, the treasury in the rear, and anything within the solid wall. Called also Naos. (See Sekos; Temple.)

The division of the enclosed structure into at least three rooms, which is common, has caused the term *naos* to be limited by some writers to the central chamber, approached through the *pro-naos*, and supposed to have had usually the cultus-image at the end opposite the entrance. The episthodomos is then the room behind the cultus-image and not usually opening into the naos. These three rooms might be considered as subdivisions of the cella; but this use of the term *naos* has not obtained general recognition. — R. S.

CELLAR. *A.* The space below the ground story or the basement story of a building, enclosed by the foundation walls, and therefore wholly, or almost entirely, below the surface of the surrounding ground. The distinction between cellar and basement story is not absolute, and, in some cases, may depend on the use to which such a space is put, as much as on its



CEILING OF STONE SLABS CARRIED ON HORIZONTAL RIBS, SUPPORTED BY ARCHES. CHURCH AT TILLIÈRES (EURE), FRANCE; SECOND HALF OF 16TH CENTURY. (SEE PLAN.)



CEILING: APPROXIMATE PLAN OF CEILING AT TILLIÈRES, SHOWN IN CUT relative situation. Thus, in an English basement house, the front portion of the lowest, nearly subterranean, story will frequently be without windows, and used merely for storage of fuel and the like, and will therefore be referred to as a cellar; but the same story might be equally well provided with large windows opening into an area, and would then be used as a living room or for domestic offices, and would be called a basement story. Hence, as such a space is commonly used for storage and the like, —

B. Any underground or partly underground place of deposit for wine, provisions, fuel, or the like. In cities there is often a special chute for coal, kindling wood, and the like; and the cellars of stores and warehouses have elevators or lifts, often outside the walls of the building and in areas.

Earth Cellar. A cellar in sense *B* above, excavated in the face of a steep slope of ground, and at its foot, so as to have a floor at about the level of the ground in front. Such a chamber will be nearly enclosed on three sides by the natural soil, the roof being usually boarded, but perhaps of earth supported from below. A common means in the United States of obtaining a cool storage place.

Subcellar. In a building having more than one cellar as described under definition *A* above, the lower or one of the lower underground stories. The great height of the recent sky scrapers of the United States has made it desirable in many cases to extend the foundations to solid rock, as in New York City. The foundations will then reach a depth of perhaps thirty or forty feet, allowing of the construction of three or more stories below the street level. The uppermost story will then usually be known as the cellar, and lower ones as subcellars.

Wine Cellar. A room arranged for the reception of wine and other fermented or distilled liquors. The primary requisite is that it should have a very even temperature, the warmth of the atmosphere within it changing gradually, if at all. Ventilation is only needed so far as dampness is to be avoided, and a very slow changing of the air should be sufficient for this. Excellent results have followed, when the general cellar space is dry, by shutting off a piece of it completely without any provision whatever for the changing of air. It is customary to provide a separate room for wine, etc., in casks and for that which is bottled. The room for casks should be spacious enough to allow of the fining, bottling, etc., of the liquor contained in the casks. The cellar for bottled liquors should be fitted up with shelves, although recent devices of light ironwork, wire, etc., and also of baked clay in the form of hollow tiles, have been made for the same purpose. With ordinary wooden shelving, a distinction must be made between bottles that are to set up and those which are to be laid on their sides; for these latter it is good to arrange the shelving so as to make diagonal compartments like very large pigeonholes set cornerwise, with one of the angles pointing downward. — D. N. B. S.

CELLARAGE. *A.* The whole of the cellars under a building, or a system of cellars.

B. The storage or capacity of a cellar or system of cellars.

CELLAR DOOR; FLAP. The door to a cellar; particularly a heavy batten door admitting to a cellar from the outside. When this door, singly or in a pair, is placed in a slanting plane over a bulkhead and stairs leading down to a cellar, it is sometimes called a cellar flap.

CELLARINO. In Italian, the necking or cylindrical portion between the Astragal and Echinus, of a Roman Tuscan, or Doric capital. (See Necking.)

CELLINI, BENVENUTO; sculptor, goldsmith, decorative artist; b. 1500; d. Feb. 14, 1571.

Of all his work, that which most nearly approaches architectural character is the bas-relief called The Nymph of Fontainebleau, once over the portal of the Château d'Anet (see De l'Orme, Philibert) and now in the Louvre, and the Perseus beheading Medusa, with its pedestal decorated with bas-relief and statuettes, now in the Loggia dei Lanzi at Florence.

Eugène Plon, *Benvenuto Cellini*; Émile Molinier, *Benvenuto Cellini*; Müntz, *Renaissance*; Perkins, *Tuscan Sculptors*; A. Bertolotti, *Benvenuto Cellini a Roma*; Cellini, *Vita* (Tassi ed.); Cellini, *Œuvres complètes* (édition Léclanché); and his Autobiography, of which the best English translation is that of J. Addington Symonds; and in the General Bibliography, Cicognara; Seubert.

CELLINI, GIOVANNI; architect and musician.

The father of the famous Benvenuto Cellini. (See Cellini, B.)

CELLULAR. *A.* Of or pertaining to cells, or having the character of cells, as the cellular system of prison planning, or a cellular monastery.

B. Constructed with or upon a system of cells, as a cellular wrought-iron beam.

CELTIC. (See Keltic.)

CEMENT. Any material by means of which substances are made to adhere to each other. In this sense, glue is the cement most used in carpentry work; gum tragacanth, gum Arabic, and various mixtures are used under the general term mucilage for minor operations of the sort; shellac is much used in making small repairs in cut stone. Especially, in building, same as Calcareous Cement (see subtitle below); also mortar made with a large share of that material.

Calcareous Cement. A cement consisting largely of lime, the other ingredients being chiefly clay, which gives to such cement a greater or less degree of hydraulicity. (See Hydraulic Cement.) It may be either a natural cement, — that is, prepared directly from one of many natural forms of impure limestone, — as is the common Rosendale cement extensively used in the eastern United States; or artificial, — that is, prepared by mixing limestone or chalk in certain proportions with clay and perhaps a small amount of other ingredients, — as Portland cement. Such elements are supplied in the form of a fine powder, and require only to be mixed with water and sand for use as mortar, although a certain proportion of common lime is frequently introduced, usually for reasons of economy.

Hydraulic Cement. A calcareous cement (see above) which has the property of setting under water without exposure to the air, and which is therefore valuable for subaqueous and similar masonry work.

The hydraulic cements used in building are derived from the impure limestones, containing different proportions of clay and silica, or are artificial combinations of those materials with common lime, calcined and ground. The name "Roman cement" is applied in Europe to all the light, natural cements, the materials for which are found in great variety, and widely distributed.

The stone generally contains about sixty per cent of lime and magnesia to about forty per cent of clay (silica and alumina), generally with a little iron and potash. The stone is burned in kilns until completely calcined, but care is taken that it is not overburned, which would render it inert. The Rosendale cements, among the best of those found in the United States, are of this class. They contain carbonate of magnesia in much greater proportion than the "Roman" cements of England and France. Others of this class are found in many parts of the United States, — in the valleys of the Potomac and James rivers, along the Erie Canal, in Ohio and Kentucky. With slight differences in composition, they possess nearly the same practical value. The Rosendales, from the valley of the Hudson, and the Louisville (Kentucky) are perhaps the best.

Maya Cement. One composed of lime and zaccab.

Portland Cement. An artificial calcareous cement composed primarily of limestone and clay. So called because of its resemblance, when finished with a smooth surface, — as on the face of a wall, — to the well known Portland stone of England, where such cement was first manufactured.

The Portland cements differ from the so-called Roman cements in the relative proportions of lime and clay which they contain, the best proportions being 20 to 22 of clay and 70 to 80 of lime. The clay should contain about $1\frac{1}{2}$ or 2 parts of silica, forming a silicate of calcium by the reaction of silica and lime in the presence of fusible combinations of iron and alumina. There is produced in the Portland cements a fusible silico-aluminate identical with that which forms the essential element of blast-furnace slag, in which sesquioxide of iron partially replaces the alumina. Its only useful purpose is to serve as a flux to favour, during the burning, the combination of silica and lime. When blast-furnace slags are precipitated, while still liquid, into cold water, they combine with hydrated lime in setting, and give rise to silicates and aluminates of lime identical with those formed by entirely different reactions during the setting of Portland cement. These are the so-called "slag" cements.

The various Portlands are made by mixing and grinding the material, generally wet, drying it, breaking it into pieces, and burning to incipient calcination. The weight of good Portland cement should be not less than 112 pounds to the bushel; that of the Roman and Rosendale cements is about 75 pounds.

— W. R. Hutton.

Roman Cement. (See Hydraulic Cement above.)

Slate Cement. *A.* A hydraulic cement manufactured from argillaceous slate.

B. A plastic roofing material made of broken slate mixed with tar, asphalt, or some similar material.

Water Cement. Same as Hydraulic Cement. (See subtitle above.)

CEMENT (v.). *A.* To secure together by means of cement.

B. To finish, fill, or cover with cement, as a floor.

CEMENT STONE. A stone from which cement may be made; especially any hydraulic limestone.

CEMETERY. A place prepared for the burial of the dead; a graveyard, but rather one which is apart from any church, and which is established by the community or by private persons for the purpose of selling lots to families, societies, or the like for the excavation of graves and the erection of monuments. During the past century there has been a great tendency to lay out cemeteries of considerable natural beauty, and to treat these as parks; the selection for this purpose of very beautiful pieces of ground, sites commanding a fine prospect, and the like may, perhaps, be thought unreasonable when the more common introduction of public parks and pleasure grounds makes the cemetery less commonly a place of resort. (For cemeteries which have much architectural treatment, see Campo Santo. — R. S.

CEMETERY BEACON. Same as Lantern of the Dead.

CENACULUM. (Written also Cænaculum; [illegible]. In Latin, from *cena*, the principal [illegible] by the Romans: —

A. A dining room, especially one in an upper story, the custom of having such dining rooms dating only from the last years of the Republic and the early Empire.

B. By extension, an upper story, as in a Roman house. These, in the country houses, and in the town houses known to us in Pompeii, were partial, extending over one wing of the house, and might include only the upper dining room with its appendages. At a later time, the term is used for the upper stories in a many-storied house of Rome, and came to signify even a garret or place of lodging for very poor people.

CENDRÉE DE TOURNAI. A kind of hydraulic cement used in Belgium, composed of caustic lime from the Tournai limekilns and the slaty coal ashes left from the kiln fires. The lime is slaked by sprinkling with water, and the mixture, after being buried for some weeks, triturated, and dried, forms an excellent hydraulic cement. — A. D. F. H.

CENOTAPH. Literally, an empty tomb; a monument erected to the memory of one not interred in or under it.

CENTERING. (See Centring.)

CENTRAL AMERICA, ARCHITECTURE OF. That of the five states: Guatemala, Honduras, Nicaragua, San Salvador, and Costa Rica, and the colony of British Honduras.

I. **Precolumbian.** This region is rich in ruined structures that belong to the Precolumbian class of American architecture. Few groups have been systematically investigated. Dense forest covers much of the land, and there are other difficulties. Stephens, Squier, Maudsley, and some other archæologists have been over portions of the ground. In all these states, except in Costa Rica, where the remains are different and seem to show South American influence, tribes of Maya and of Nahuatl stock have built. Copan, in Honduras, has been the most carefully examined, but even there much remains to be done. It was a ruin in 1576, when Palacio, the first European visitor, saw it. Stephens made the first scientific examination, in company with the artist Catherwood, in 1839, and since then Maudsley has devoted long study to the place. The latest investigations were directed by Harvard University. Of the great forest which covered the ruins in Stephens's time, people living near by removed some from the terraces for planting, Maudsley cut away a lot more, and Saville, of the Harvard party, cleared the main structure and other parts. A section of the principal mass has been exposed by the cutting of the river, and exhibits three thick layers, one above another, divided by pavements of cement, the present buildings resting on the last, or topmost, pavement. It is probable that each floor sustained in former times various buildings, and architectural work here, therefore, seems to be of great antiquity. Copan has been called the oldest city in America. The central mass rises in steps and terraces, forming a huge platform which culminates in terraced elevations bearing the ruined buildings described as temples, but which were probably of varying function. The casing of the mound and the walls of buildings are of fairly well-dressed oblong stones laid, usually, without mortar. Little or no attention was paid to breaking joints. The mound slopes were built in terraces about five feet high and five feet wide, or in steps of single or double rows of stones. As in all this class of works, the masonry was coated with stucco which was then coloured. The main bulk of the mounds and foundations is a rubble of rough blocks of stone and mud, apparently bound together by internal upright walls. The general construction being the same as that of the Yucatan Maya ruins, and the vault used being the same so-called triangular, or corbel, arch found there, and the inscriptions being similar, these remains may be safely classed as Maya, though we have no decipherable records of the builders. The sculptures seem to be of a somewhat finer order. Twenty-three remarkable *stelæ*, or monolithic monuments, elaborately carved with human figures and hieroglyphs, have been found. Each had in front a sculptured block described — for want of a better name — as an altar. Their average height is 12 feet, and their breadth and their thickness each about 3 feet. Stelæ and so-called idols have been exhumed around Lake Nicaragua, Lake Managua, and in other parts, and there are numerous mounds; but all remains grow less imposing toward the south, and correspondingly important as Yucatan is approached. It is important to note that the southern limit of Maya inscriptions is just beyond Copan, and the northern at the Isthmus of Tehuantepec. Other ruins of this region are those of Cahuinal, Tikal, and Quirigua, in Guatemala, and the old capital of the Cakchiquels, by them called Iximche, lying between Lake Atitlan and the Rio Motagua, and said to be 3 leagues in circumference. Further east are the ruins of Mixco, and in western Guatemala lies Utatlan, the ancient capital of the Quiches, who are classed as Maya stock. Tenampua, in Honduras, occupies a hill which is fortified by walls terraced on the inside. There are three or four hundred mounds there. Much destruction has been caused by the use of stone from ruins for modern building purposes.

II. **Modern.** The houses of the people are usually small huts made of canes and palm leaves, or of sticks plastered with adobe mud, and whitewashed. In the towns adobe bricks are largely used, sometimes with a cut stone foundation, as adobe disintegrates most rapidly near the ground. Cajon is also common, the town of Amatitlan being almost wholly so constructed. Aside from churches, which are numerous, there are few structures of importance. Houses are rarely more than one story, and, as customary in tropical countries, are without glazed windows. They usually enclose a patio or courtyard with fruit and shade trees. The churches are often of great size, and sometimes stand in remote and unfrequented places. The finest, and also the most noted, building in all Central America is the cathedral at Leon, Nicaragua, finished, according to Squier, in 1743, after thirty-seven years of labour. It is of cut stone, covers an entire square, and the roof is massively vaulted. The ornamentation is stucco. There is less of the Moresque about it than is usual with Spanish-American architecture. It was often used as a fortress during revolutions, and the exterior is much indented by bullets. There is little ornamentation inside, but the altar is silver, elaborately chased. (See Adobe; Cajon; Calli; Corbel Arch; Communal Dwelling; Jacál; Mexico, Part I.; Mound; Pisé; Teocalli; Zaccab.)

E. G. Squier, *Nicaragua*; John L. Stephens, *Incidents of Travel in Central America, Chiapas, and Yucatan*; Peter F. Stout, *Nicaragua, Past, Present, and Future*; H. H. Bancroft, *Native Races, and History of Central America*; Desiré Charnay, *Ancient Cities of the New World*; Elisée Reclus, *The Earth and Its Inhabitants*, Vol. II., *North America*; Peabody Museum, *Memoirs*; Justin Winsor, *Narrative and Critical History of the United States*, Vol. I.; Brasseur de Bourbourg, *Histoire des Nations Civilisées du Mexique et de l'Amérique Centrale*, and *Recherches sur les Ruines de Palenque*; Julius Froebel, *Seven Years' Travel in Central America*; W. H. Holmes, *Ancient Pottery of Chiriqui*, and *Archæological Studies among the Ancient Cities of Mexico*; D. G. Brinton, *Essays of an Americanist*; Sahagun, *Historia de la Nueva España*; Maudsley, *Archæology*, in *Biologia Centrali-Americana*, *The Harvard University Memoirs*; and works of Saville, Herrera, Humboldt, Kingsborough, Stoll, and Dr. Berendt.

— F. S. Dellenbaugh.

CENTRE (written also Center).

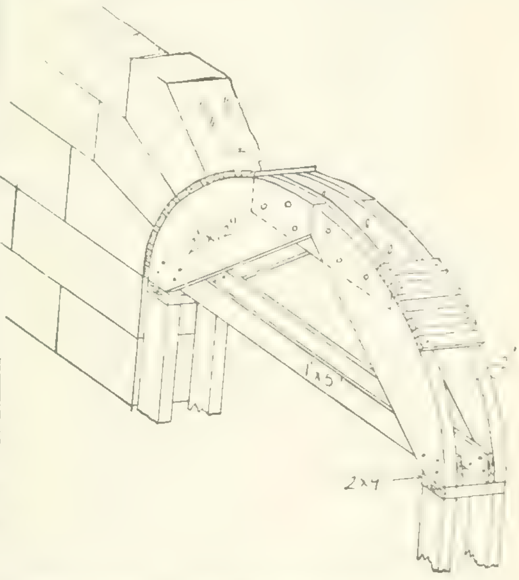
A. When used familiarly, a centre line, a middle line, an axis, whether of a surface or of a solid. Most common in these phrases: Between centres, from centres, from centre to centre, on centres, denoting the giving or taking measurements from such a line to the next corresponding similar line.

B. Same as Centring.

CENTRE MOULD. A thin piece of board or the like, the edge of which is shaped to a given profile, and which, when rotated about a pivot at one end, will cut corresponding circular mouldings in soft plaster or the like.

CENTRE PIECE. A decorative composition, usually circular, oval, or radiating in design, forming the central feature or motive of a large decoration; particularly in common speech, such an ornament in the centre of a ceiling. Plaster centre pieces are cast in moulds and sold separately for application to plastered ceilings. Recently centre pieces have been made of carton pierre and many other compositions, and in ceilings of thin metal the centre pieces may be very elaborate.

CENTRING. A timber framework or mould, upon which the masonry of an arch or vault is supported until the key is placed which renders it self-supporting. The centring for a stone arch is composed of parallel frames or longitudinal ribs regularly spaced, which follow the form of the intrados of the arch, and upon them the transverse laggings are placed which support the stones of the arch. In small arches the laggings are planks forming a close surface; in larger works, each course of arch stones is supported by a single light timber. The ribs are formed sometimes of beams of convenient length, dressed on the outside to the curve of the arch, and supported at their ends, or junctions. For small arches they are formed of several thicknesses of boards cut to the proper curve and nailed together, breaking joints. The framing, or the supports of the ribs, vary according to the conditions and the skill of the designer. They may be divided into two general classes: those which are supported from the ground or floor under the arch by means of radial or normal struts, or by vertical posts; and those which are car



Centring for an Arched Opening of Small Span.

ried by the piers or abutments at the ends of the open span, being either trussed or supported by arch braces transmitting the weight to the ends. The former method is much to be preferred when points of direct support can be obtained. The centring must be not only strong enough to carry the weight of the arch, but also so arranged that it will not change its shape as the successive weights are placed upon it. To facilitate this purpose in long spans, the masonry is sometimes placed on the arch in blocks, so that nothing is keyed or closed until the whole weight is on the centre, and there is no risk of its changing its shape. At the Pont Notre Dame, in Paris, all the ring stones were laid dry, separated by small wedges; when all were in place the joints were filled with mortar with a *fiche*, or sword, with a notched blade made for the purpose. — W. R. HUTTON.

Cocket Centring. A form of arch centring in which the horizontal tie beam at the spring is dispensed with, and its functions fulfilled by a system of bracing, so as to allow room for passing under the structure, as that of Waterloo and several other London bridges erected without interrupting river traffic.

—A. D. F. H.

Common Centring. The form of centring used for arches of small span, as over doors and windows in ordinary buildings; it consists usually of a chord, or tie beam, or board at the bottom, and two or more planks spiked together, and with the outer edges cut to the shape of the arch. — A. D. F. H.

Groin Centring. Properly, the centring built under the two crossing lines where the groins of a groined vault are to be built, which centring must obviously be of great solidity. It is not usual to proceed in this manner, however, and the term may be stretched to imply the use of the centring prepared for a groined vault. If used in connection with ribbed vaulting it is erroneous.

CENTROLINEAD. An instrument for ruling converging lines whose meeting point is beyond the limits of the drawing. Used particularly in perspective drawing. It is made in a great variety of forms based on different mechanical and geometrical principles.

CEPHISODOTUS (Kephisodotos); sculptor.

He is supposed to have been the father of the great Praxiteles (see Praxiteles). One of his most important works was a statue of Eirene carrying Ploutos (Peace bringing Plenty) which was set up at the Peiraeus (the port of Athens) to commemorate the peace of 371 B.C. A copy of this work (Brunn, op. cit.) is in the Glyptothek at Munich. A copy of the infant Ploutos was recently found at the Peiraeus. A son of Praxiteles also bore the name *Cephisodotus*.

Brunn, *Die Sogenannte Leukothea*; Collignon, *Histoire de la Sculpture Grecque*.

CERAMIC. (See Keramics.)

CERCEAU. (See Androuet Du Cerceau.)

CERCIS. The wedgelike or trapezoidal body of seats between two climaces or stepped passageways in a Greek theatre. (See Climax; Cuneus; Theatre.)

CEROMA. In a Greek gymnasium or Roman bath, a room for the anointing of the bather with oil and wax. The distinction is not clear between the *ceroma*, *elæothesium*, and *unctuarium* of the Roman baths.

CERRO. A mound or hill. In Mexico applied to the so-called pyramids (see Mound). Cerro Alto, at Palenque, is over 487 feet high.

— F. S. D.

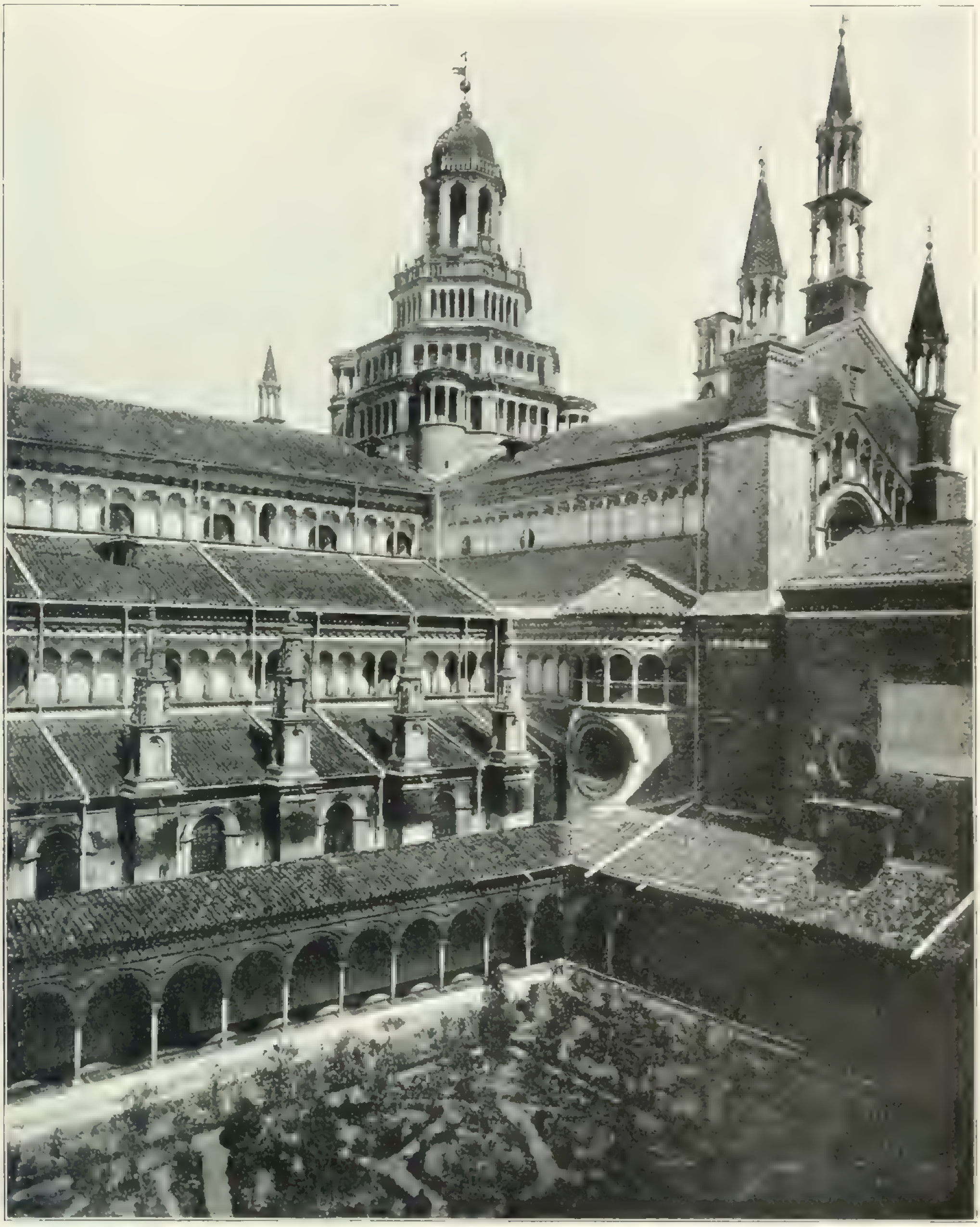
CERTIFICATE. In architectural practice, usually, a paper signed by an architect or his representative stating that a payment is due to the contractor. The contract usually provides for payment by instalments, and only on the presentation of such certificates.

CERTOSA. In Italian, a Carthusian monastery; same as Chartreuse. The most artistically important of the many establishments known by this name are the following: (1) Near Pavia in Lombardy; the most celebrated monastery of Italy, and containing an interesting round-arched church and cloisters of the fourteenth century, and a façade or west front of the church which was added in the fifteenth century, and is the finest piece of elaborate and richly adorned Renaissance architecture in existence. No building shows so well as this front what might have been done by the Renaissance architects had the classical influence of the students of Roman monuments been less overwhelming. The round-arched, mediæval work of the body of the church is also extremely interesting, as showing what the Italian architects of the later mediæval epoch might have done with a round-arched style (compare Loggia dei Lanzi). (2) Near Florence, in Val d' Ema, about three miles southwest of the city, an interesting structure like a mediæval strong castle, containing tombs, stalls, doorways, pavement, etc., of great richness and beauty. (3) Near Pisa, in the *Valle di Calci*, and often called by the name of that locality; much modernized, but containing interesting works of art. (4) Near Bologna; now used as a cemetery (Campo Santo), but often referred to as "*la certosa*." (5) Near Naples, called Certosa di S. Martino, with extensive and elaborate buildings of the seventeenth century. (See Monastic Architecture.) (Cuts, cols. 493, 494; 495, 496.) — R. S.

CERTOSINA WORK. A kind of inlay or intarsia work made by the inmates of Carthusian monasteries in Italy.

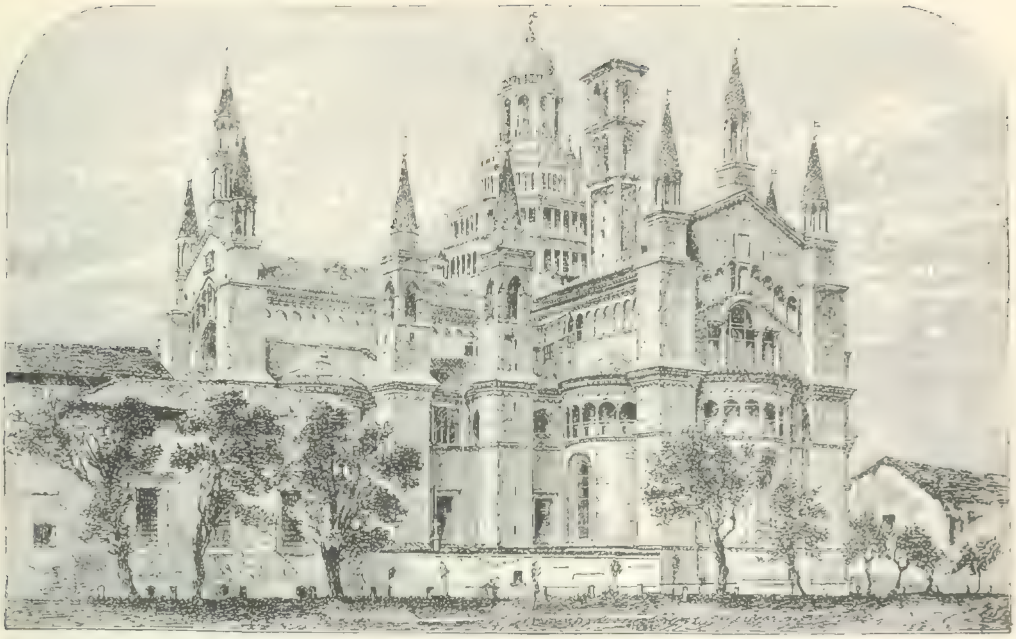
CERVIA, BERENGUER; architect.

A memorandum dated Sept. 28, 1434, indicates that Cervia succeeded in that year



CERTOSA

That near Pavia; the church seen from the smaller cloister with the south transept, central tower, and south flank of nave with south aisle and chapels. The round arched architecture of this building, contemporary with the latest Italian Gothic, and closely preceding the classical Renaissance, it is of the years following 1400, should be compared with that of the Loggia dei Lanzi in another plate. The great pinnacles along the wall of the chapels on the left are later, with strong classical feeling.



Certosa, near Pavia, Lombardy, Italy.

Pedro Cipres (see Cipres) as architect of the cathedral of Gerona (Spain).

Viñaza. *Adiciones al Diccionario Historico.*

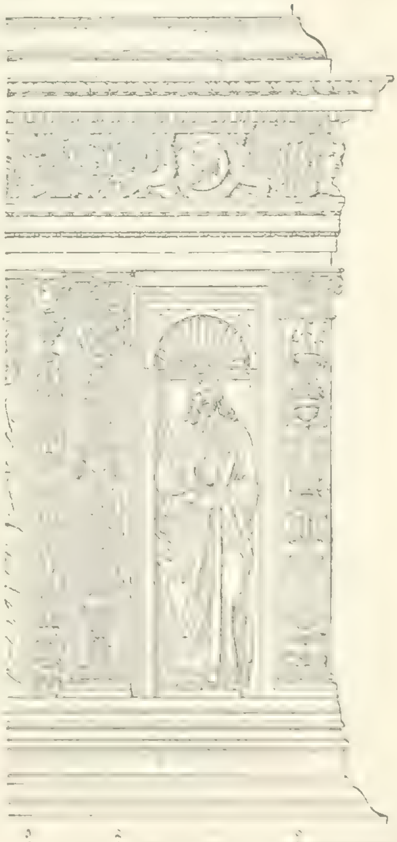
CESARIANI (CESARIANO), CESARE; architect and painter; b. about 1483; d. 1546.

A pupil of Bramante (see Bramante) who assisted him in his Milanese work. Portions of the church of S. Maria presso S. Satiro (Milan) are attributed to him. He is best known by his translation of Vitruvius, *Di Lucio Vitruvio Pollione de Architettura libri dece, traducti de Latino in Vulgare, affigurati, commentati*, Como, 1521.

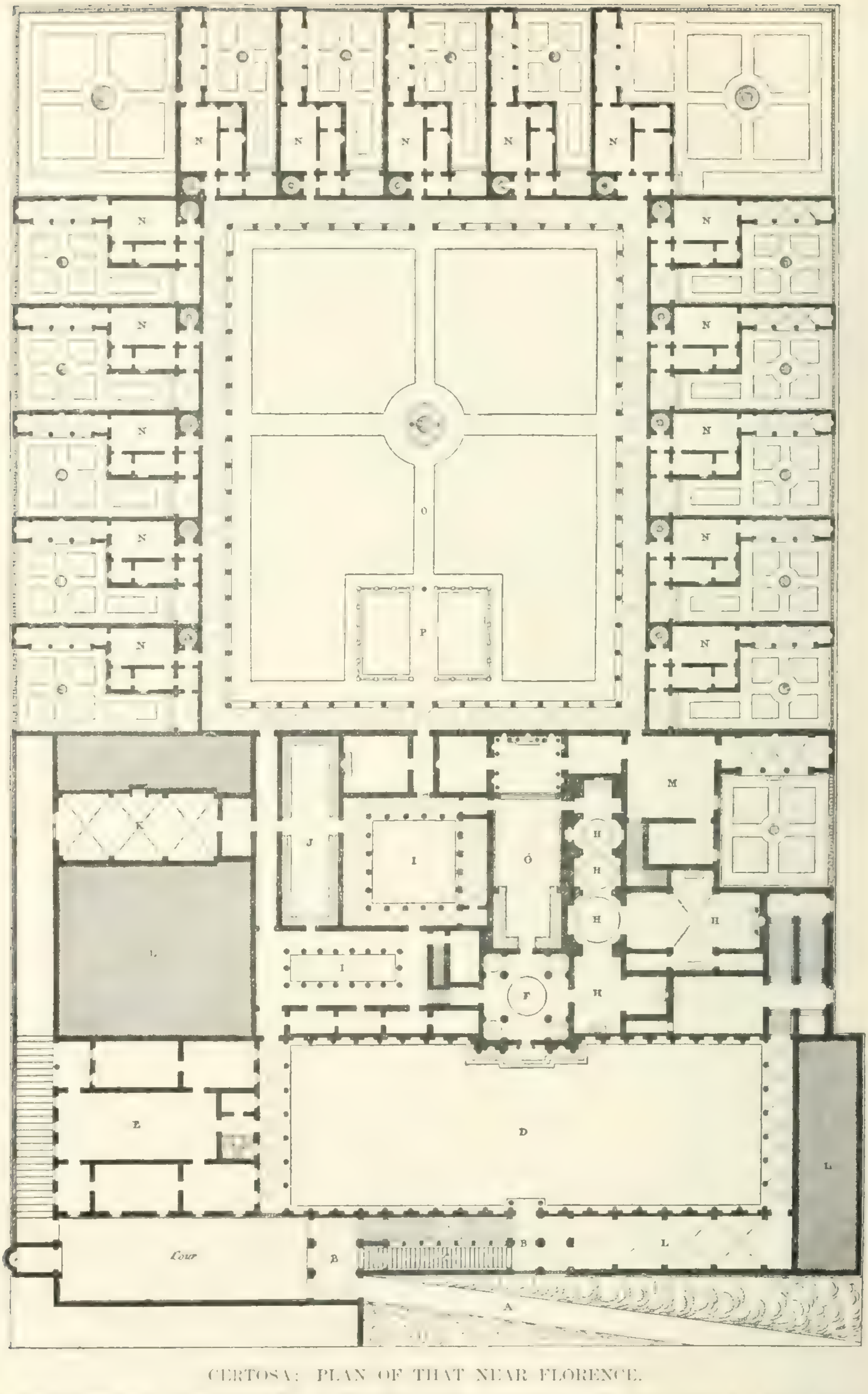
De Pagave e Casati. *Vita di Cesare Cesariano*; Muntz, *Renaissance*; W. V. Seidlitz, *Bramante in Mailand.*

CESCOMES, PEDRO DE. (See Pedro de Coma or Cescomes.)

CESSPOOL. A sunk pit, generally covered, intended for the reception of solid and liquid waste matters, as from inhabited buildings. There are two kinds of cesspools, viz., leaching and tight cesspools; the former built of stones laid dry, with open sides and bottom, permitting the liquid sewage to escape or leach away into the subsoil; the latter built of stone or brickwork, laid in hydraulic cement mortar, and made water-tight in the same manner as cisterns. From a sanitary point of view cesspools are condemned as involving the storage on the premises of putrefying organic matter. Cesspools are often built in two chambers, the first being a settling tank for solids and retaining the greasy scum (grease trap); the second a



Certosa, near Pavia: Detail of the Front of the Church; about 1475 A.D.



CERTOSA: PLAN OF THAT NEAR FLORENCE.

A. Road of approach to the lobbies *B.* *B.* Vaulted lobbies of entrance. *C.* Stairs leading to upper story. *D.* Outer court, giving access to vestibule *F.* *E.* Residence of the Superior. *F.* Vestibule leading to the monastery proper. *G.* Church. *I.* Small cloister. *H, J, K, L, M.* Buildings of administration, kitchens, bake-houses, lodgings for strangers and the like. *N.* Monks' cells. *O.* Cloister. *P.* Lavatory.

liquid chamber, emptied by bailing out or pumping out when filled, and the two chambers being connected by an overflow pipe, dipping well down into the first chamber. (See Drainage.) — W. P. GERHARD.

CEYLON. ARCHITECTURE OF. The island of Ceylon possesses no architectural monuments other than the ruins of its antique grandeur. It would seem that not a building of architectural importance has been erected in six hundred years, and neither the Portuguese, the Dutch, nor the English have enriched the island with a single worthy edifice. The island has for 2000 years been almost wholly Buddhist, so that it lacks both Brahman temples and Moslem mosques other than the most insignificant examples; and Buddhism has never encouraged the erection of great temples, at least in Ceylon. Architecturally Ceylon is interesting only for its ruins, and these mostly of great antiquity and greatly broken down by the rank vegetation which has overrun the deserted sites. Wood seems to have been the material chiefly used for the magnificent *viharas* (monasteries) and palaces described in great detail in the *Maha-wanso*, and this has long ago rotted to dust. Brick covered with white *chunam* was the material most employed for masonry, and the colossal engineering works of antiquity — dams, canals, and reservoirs — were mostly earthworks. Masonry of stone seems to have been used but sparingly, though occasionally huge blocks were hewn, transported, and carved for special purposes, and causeways and spillways of cut stone still attest the skill of the ancient engineers.

The most important ruins are found in two groups at Anuradhapura and at Pollonarua (the modern Toparé), the ancient capitals of the island. Those at Anuradhapura comprise six important *topes* or *dagobas* — hemispherical or bell-shaped tumuli of brick, serving as shrines for Buddha relics; the 1600 monolithic piers which once supported the nine-storied "Brazen Palace" (*Mahaloya Paya*) of Dutugaimunu (160 B.C.), a wooden structure covered with gilded copper, many times burned and rebuilt; and numerous minor shrines. At Pollonarua (Toparé) are two important topes; two vast stepped platforms, one with the ruins of a palace, the other bearing those of the Jetawanarama temple, now roofless, and of the Kiri *tope;* a round shrine and a stepped pyramid shrine, the Sat Mahal Prasada; besides many columns of long-forgotten palaces and monasteries. These various ruins date mostly from the latter part of the twelfth century.

The Ceylon *topes* are remarkable for their enormous size and great antiquity. Of those at Anuradhapura, the oldest is the Thuparamaya (250 B.C), of bell-shaped form, 70 feet high, and surrounded, as are most of the others, by a triple procession path, in this case adorned with slender monolithic columns. The Abayagiri and the Jetawana, the first-named dating from 87 B.C., the second from 330 A.D., are each 360 feet in diameter; and their ruins reach a height of over 240 feet. Near these are three other important topes, the Ruanwelli and Mirisiwettya (164 B.C., the former 270 feet high); the Lankaramaya (276 A.D.) is wholly in ruins. At Pollonarua the Kiri and Rankot dagobas are important; while at Mihnitala the Ambustella tope is in excellent preservation with its pinnacle and encircling columns. At Dambool is the only rock temple of Ceylon having any marked architectural quality, with a very florid façade. Besides these and a few other less important structures, there are innumerable ruins and fragments scattered through the island, as at Dambedenya and Yapahoo and for miles about Anuradhapura; but so completely overthrown as to make restoration and identification impossible. Architecturally, Ceylon is a city of the dead.

The standard work on Ceylon is J. Emerson Tennent's *Ceylon* (London, 1860). There is a short chapter on the architecture of Ceylon in Fergusson's *Indian and Eastern Architecture*. The Ceylon government is conducting an archæological survey of the island, but its reports are not available as yet at this writing. — A. D. F. HAMLIN.

CHABAT, PIERRE; architect; b. Feb. 22, 1827; d. Jan. 8, 1892.

Chabat studied architecture at the *Atelier Garrer* in Paris. He was employed by the *Chemin de fer du Nord* from 1854 to 1858, and at the *Exposition Universelle* of 1855. In 1865 he entered the architectural service of the city of Paris. Chabat published *Fragments d'Architecture*, *Eléments de construction*, *Dictionnaire des termes employés dans la Construction*, *La Brique et la Terre Cuite*, etc.

Ch. Lucas, in *Construction Moderne*, Jan. 16, 1862.

CHAIN COURSE. A bond course of stone headers fastened together continuously by metal cramps. A noted example is the triple chain course in the choir of Notre Dame, Paris (1195).

CHAIN TIMBER. A timber in Chain Bond (which see under Bond).

CHAIR RAIL. A horizontal band or strip, generally of wood, secured to the sides of a room at a height from the floor equivalent to the usual height of the backs of chairs, in order to prevent them from injuring the face of the wall. It is commonly decoratively treated to conform with the general woodwork, and the space of wall beneath is often finished as a dado.

CHAITYA CAVE. In Buddhist architecture a rock-cut temple to enshrine a *chaitya* (object of veneration). The design is three-

[illegible], the lofty central aisle is [illegible] a barrel vault roof, terminating in a semidome over an apse, [illegible] stands the Dagoba, or *chaitya* [illegible] the shrine. The side aisles, separated by massive ornate piers, are usually flat-roofed. At the front are internal and external galleries, and a door to each aisle; the upper part of the front is open. Important examples are found at Ajunta, Dhumnar, Ellora, Kaunari, Kaili, Nassik, and other points, especially in the Bombay Presidency. (See India, Architecture of.) — A. D. F. H.

CHALCEDONY. In general, the ordinary white, gray to black, greenish, bluish, brown, and red varieties of cryptocrystalline silica. The name jasper is applied to the more pronounced brown, yellow, and red varieties, one form grading into the other without distinct lines of demarkation. Agate is the name given to the banded varieties such as form in cavities in igneous rocks and more rarely elsewhere. Their natural colours are white, grayish, and red; the mahogany and smoky brown colours are all artificially produced. Onyx proper is a variety of agate, though the same name is incorrectly applied to certain banded calcareous rocks (see Onyx under Marble). Carnelian is a clear red chalcedony, and sardonyx is an agate with carnelian bands. Flint and chert are impure forms occurring in nodular masses in limestones and chalk. Opal is the completely amorphous, glass-like form of silica occurring under much the same conditions as chalcedony. The varieties used in jewellery are found mostly in cavities in igneous rocks. — G. P. Merrill.

CHALCIDICUM. An annex to a Roman basilica. Its location and use are not clearly discernible from the texts, some of which, indeed, refer apparently to a separate and independent edifice. By modern writers the term has been applied to the narthex or other appendage to a Christian basilica.

CHALDEAN ARCHITECTURE. (See Mesopotamia.)

CHALET. A wooden dwelling house of the type common in Switzerland. The châlets are of two different types as for the structure: (*a*) the type derived from the log house, of heavy beams placed one upon the other and crossed at the angles; Oberland, Uri, Schwytz, etc.; (*b*) the framework building, a structure of posts and beams, with the wall merely filled in with thick boards, or even bricks, etc., Zurich, Saint Gallen, Appenzell. A few châlets combine the two types. The châlets still existing were built in the three last centuries, but are the continuation of a tradition and of an art anterior to that time. In both types, the principal qualities are simplicity and logic of construction. The façade indicates the interior; the floor-beams are apparent and show the division into stories, which demarkation is often accentuated by a penthouse or a carved decoration. All the organic parts of the construction, the framework, etc., are emphasized so as to produce a decorative effect; the brackets that support the roof are enormous, the chimneys are monumental, also the dormer windows; nothing is hidden or masked. The roof advances considerably on the front, from four to ten feet; on the sides of the house it extends widely, sometimes even it comes down to within three or four feet of the ground; the sides being so well protected, galleries or balconies are placed there, where the staircase is also generally found; sometimes there are also small balconies on the front, but only on the upper story, and always sheltered by the roof.

The decoration belongs to the building itself; it is not superadded, but is part of the necessary and organic members of the construction, and covers them with sculptured ornaments and designs. As the châlet has its origin in early mediæval architecture, so does the ornamentation continue, in wood, the admirable Romanesque decoration. The influence of the neoclassic Renaissance was felt very late and very slightly. Even in the eighteenth century the châlets are more often faithful to the spirit of mediæval ages; it is in the furniture, the dressers, etc., that the neoclassic ornament makes its appearance.

It is well to compare some of the designs of the carving, with the wood carving of Norwegian art. They both come from the same, very distant, Oriental source of art. Finally, painting is often employed to complete the work of sculptural decoration, either being architectural, and serving to strengthen the general effect of carved decoration, or else being quite independent.

The roofs of the châlets are adapted to different climates. The very steep, high roof is that of the châlet of the plain; and it is built to allow the rain water to run off rapidly. The second, or mountain, châlet is built for a country where snow is abundant and heavy; it has a broad, low roof, crossed by long, horizontal beams and shingles, so that the snow may accumulate on it, and protect the house from the exceeding cold of the winter.

The ingenious fancy of the carpenter-architects has been pleased to vary infinitely these two types of châlets, but they have always remained faithful to the general rules indicated above, and to the spirit and the requirements of the art of building in wood. They have not attempted to apply to wood the laws of stone architecture, and it is to that fact that we owe the purity, the elegance, the originality of the Swiss châlet that holds a place quite apart in the history of architecture. — Jean Schopfer.

For the bibliography of Châlet, see books referred to under Switzerland.

CHALGRIN, JEAN FRANCOIS THERESE; architect; b. 1739; d. Jan. 21, 1811.

Chalgrin was a pupil of Servandoni (see Servandoni) and Moreau. He won the *Grand Prix de Rome* in 1757. On his return from Italy he was made inspector of public works of the city of Paris, under Moreau. About 1777 he rebuilt the northern tower of the church of S. Sulpice in Paris (see Servandoni), and designed the organ loft of that church. Chalgrin is famous as the designer of the Arc de Triomphe de l'Etoile (Paris). Napoleon I. (b. 1769; d. 1821) first intended that this monument, originally called Arc de Triomphe de la Grande Armée, should be placed on the Italian boundary. When work upon it was undertaken in 1806, he changed the location to the Place de la Bastille (Paris), and the name to Arc de Marengo. The location was objected to by the Académie de l'Architecture, and was changed to the present site. Chalgrin began the work in association with Jean Armand Raymond (see Raymond, J. A.). Raymond retired in 1808, leaving Chalgrin in charge, who planned the arch much as it now appears. At his death the monument had been carried to the height of about 18 feet. (See Goust and Huyot.)

Quatremère de Quincy, *Notice Historique de Chalgrin*; Edouard Fournier, in *Paris dans sa Splendeur*; Bauchal, *Dictionnaire*.

CHALK. A limestone composed mainly of the calcareous tests of foraminifera, though containing, also, shells of larger mollusks. When much indurated, as in the valley of the Seine, it is used as a building material. — G. P. M.

CHAMBER. In general, a room or subdivision of a building. In common usage, especially in the United States, it is restricted to the signification of a bedroom. Particular applications of the term are: —

A. A hall or building for the meetings of a special body, as the Senate Chamber, Chamber of Commerce, etc.

B. Any subdivision or cell of a cellular structure, or member.

C. In the plural, a suite of rooms used as offices, especially, in English usage, lawyers' offices.

D. In the plural, an apartment house or suite of rooms forming a residence. Rare in the United States.

Judges' Chambers. In a courthouse, the room or rooms occupied by a judge, or by the judges of one court, when not on the bench. As many decisions, or judgments, are rendered without a formal trial (as by a jury), and after a presentation of the case to the judge alone by the attorneys of both litigants, the term "chambers" has grown to imply such legal decisions made by a judge or by several judges acting together.

CHAMBERS, SIR WILLIAM; architect; b. 1726 (at Stockholm, Sweden); d. March 8, 1796.

Chambers was the son of a Yorkshire merchant residing in Sweden. He was brought up in Yorkshire, and at the age of sixteen went to China as supercargo to the Swedish East India Company. While in China he made studies of architecture, costumes, etc., which he afterward published under the title *Designs for Chinese Buildings, Furniture*, etc. (London, 1757, folio). At eighteen he abandoned business for architecture, and studied in Paris and in Italy. Chambers devoted himself to the fully developed classical style of Palladio, which he never abandoned. Returning to England in 1755, he was presented by Lord Bute to the Prince of Wales, afterward George III., to whose personal attachment he owed much of his success. For Augusta, Princess Dowager of Wales, he erected the buildings of Kew Gardens, London. He illustrated this work in *Plans, Elevations, Sections, and Perspective Views of the Gardens and Buildings of Kew* (London, 1763, 1 vol. folio). Chambers's reputation was made largely by his *Treatise on the Decorative Part of Civil Architecture* (London, 1759, 1 vol. folio), one of the standard manuals of classic architecture. In 1771 he was made Knight of the Polar Star by the King of Sweden, and was permitted by George III. to assume the title of knight in England. In 1775 Chambers was made architect of Somerset House (London). The original Somerset House was begun by Edward Seymour, Duke of Somerset, the Protector. After Somerset was beheaded (Jan. 22, 1552), his palace became crown property. It was rebuilt by Inigo Jones (see Jones, I.). In 1761 it was decided to reconstruct Somerset House. This work was begun by Sir William Chambers in 1776.

Hardwick, *Memoir of the Life of Sir William Chambers*; Blomfield, *Renaissance Architecture in England*; Fergusson, *History of Modern Architecture*; Loftie, *History of London*.

CHAMBER STORY. A story of a building wholly or chiefly devoted to sleeping rooms. Thus, where the second story of a residence is devoted to sitting rooms, drawing-rooms, and purposes of state, the third story will be a chamber story. (See Story.)

CHAMBIGES (SAMBICHES, CAMBICHES), MARTIN; architect (*Maître Maçon*); d. Aug. 29, 1532.

Martin Chambiges was called from Paris to Sens (Yonne, France) in 1489, to design the new transept of the cathedral. He began the construction Nov. 8, 1490, and in 1494 transferred the superintendence to Hugues Cavelier (see Cavelier), afterward making occasional visits of inspection. He appears to have modified his plans in 1498. Nov. 7, 1499, Martin was invited to attend consultations in Paris concerning the reconstruction of the Pont Notre Dame, which had fallen during the preceding month. In 1501 he commenced the doorway called Portail d'Abraham; and in 1513 the northern portal of the cathedral of Sens. In 1502 Martin was invited to Troyes (Aube, France), to advise concerning the construction of the façade of the cathedral (see Bailly, Jean, I.). He designed the façade with its two towers and portal in 1502–1503, but did not commence building until the autumn of 1506. In 1500 he made the plans for the transept of the cathedral of Beauvais (Oise, France). He began construction at once, and continued in charge until his death. He was assisted by Jean Wast (see Wast, J., I.). Martin Chambiges was thus concerned in building three of the most beautiful cathedrals of France.

Berty, *Les Grands Architectes français*; Bauchal, *Dictionnaire*; Gonse, *L'Art gothique*; Quantin, *Notice historique de l'Église de Sens*; Assier, *Les Artistes dans l'Ancienne Capitale de la Champagne*; Desjardins, *La Cathédrale de Beauvais.*

CHAMBIGES, PIERRE (I.); architect; d. June 19, 1544.

A son of Martin Chambiges (see Chambiges, M.). He was associated with his father in the construction of the cathedrals of Troyes and Beauvais. In 1519 he was called to Troyes to inspect work at the cathedral executed by his brother-in-law, Jean de Soissons (see Jean de Soissons). In 1533–1534 Pierre was associated with Domenico da Cortona (see Domenico da Cortona), Jacques Arasse, and others in the construction of the Hôtel de Ville, in Paris. In 1538 he was employed at Fontainebleau under the direction of Gilles le Breton (see Breton, G. le). The most important achievement of Pierre Chambiges (I.) appears to have been the construction of the old château of Saint Germain-en-Laye (near Paris), which, with the exception of the chapel (thirteenth century), was rebuilt by him on the old foundations after 1539.

Berty, *Les Grands Architectes français*; Berty, *Topographie, Louvre et Tuileries*; Palustre, *La Renaissance en France*; Marquis de Laborde, *Comptes des Bâtiments du roi*; Calliat-Leroux de Lincy, *Hôtel de Ville*; Sauvageot, *Palais, Châteaux, Hôtels et Maisons de France.*

CHAMBIGES, PIERRE (II.); architect; d. about 1616.

Pierre Chambiges (II.) seems to have been a son of one Robert Chambiges, who in turn appears to have been a brother or son of Pierre Chambiges (I.). In 1578 he was employed at the Pont Neuf (Paris). In 1582 Pierre (II.) submitted estimates for work at the chapel of the Valois at Saint Denis (near Paris), which were rejected by Baptiste Androuet du Cerceau (see Androuet du Cerceau, B.), then supervising architect of that building. In July, 1507, he was chosen arbiter by the masters of the hospital of S. Esprit (Paris). The assertion of Sauval (op. cit.), that one Chambiges built the Petite Galerie of the Louvre is supposed to apply to Pierre (II.), but is not corroborated. He was, however, employed on the Grande Galerie.

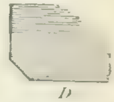
Berty, *Les Grands Architectes français*; Berty, *Topographie, Louvre et Tuileries*; Sauval, *Antiquités de la Ville de Paris*; Palustre, *La Renaissance en France*; De Chennevières, *Archives de l'Art français*; Bauchal, *Dictionnaire.*

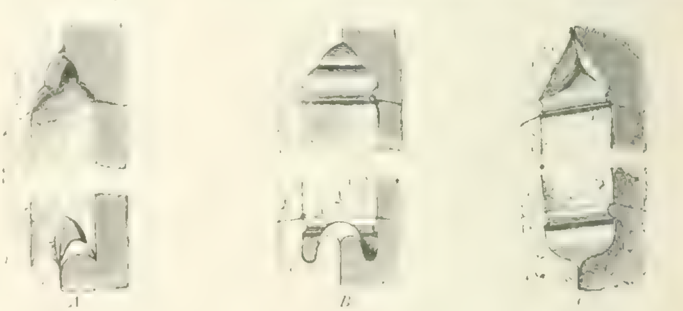
CHAMBRANLE. In French architecture, the framelike decoration around a window or door.

CHAMBRES, THOMAS DES; abbot and architect; d. 1225.

In 1222, Thomas des Chambres, abbot from 1218 to 1225, continued the construction of the large building, called La Merveille, on the north side of the abbey of Mont Saint-Michel (Manche, France), which had been begun in 1203 by the Abbot Jourdain.

Corroyer, *Abbaye du Mont Saint-Michel.*





CHAMFERS WITH ORNAMENTAL STOPS.

A. At Exeter [illegible]. *B.* At [illegible] Abbey. *C.* At Courtlodge, [illegible], Kent. *D.* Cross section of chamfer.

CHAMFER. The bevel or oblique surface produced by the cutting away a corner or arris. When the chamfer does not extend the whole length of the arris, it is called a stopped chamfer (see Stop). When instead of a bevel there is a concave surface replacing the arris, it is called a concave chamfer. A beaded chamfer is one in which a convex bead is left projecting from the bevel of the chamfer. Chamfers occur principally in woodwork, and occasionally in stone cutting. (Compare Cant; Splay.)

CHAMFRET. Same as Chamfer; old form.

CHAMP DE MARS. (Apparently a translation of Campus Martius.) An exercise-ground for troops, especially that in Paris, such a place elsewhere being commonly known as *champ de manœuvre*. The Champ de Mars of Paris is a large open tract of ground on the left bank of the Seine. The military school founded by Louis XIV., and now a barrack, fronts upon it. Architecturally, it is of interest from its occupancy by the International Expositions of 1867, 1878, 1889, and 1900, each of which involved the erection of interesting buildings.

CHAMPOLLION, JEAN-JACQUES (CHAMPOLLION-FIGEAC); architect; b. Oct. 5, 1778 (at Figeac, Lot, France); d. May 9, 1867.

Champollion-Figeac was a brother of Jean-François Champollion, the Egyptologist. He was custodian of the manuscripts of the *Bibliothèque Nationale*, professor at the École des Chartes, Paris, and *bibliothécaire* of the palace of Fontainebleau. He wrote the text to Pfnor's *Monographie du Palais de Fontainebleau* (Paris, 1863, 3 vols.), and numerous unimportant works on archæology.

La Grande Encyclopédie.

CHANCEL. That portion of a church set apart for the use of the clergy, and where the Holy Eucharist is celebrated, and the divine office is chanted. It is situated at the rear, and therefore properly eastward, of the nave, from which in large churches it is separated by a screen or rail, and, as its floor is higher than the nave, it is approached by one or more steps. The chancel is often divided into two parts — the choir and the sanctuary — separated by the altar rail. The division nearest the nave is the choir (the place of the singers), and the division east of the choir is the *sanctuary* (the place of the high altar), the place referred to by S. Ambrose (A.D. 397) in the following words addressed by him to the Emperor Theodosius, "The priests alone, O Emperor, are permitted to enter within the rail of the altar — retire [to the nave], then, and remain with the rest of the laity." (Theodorat, *Eccl. Hist.*, *B.V.C.*, 18.) The altar is in the centre of the sanctuary; the credence (or the table for the bread and wine, the sacred vessels, and the missal) is on the south side; and near by in a wall recess is the piscina — a drain to receive the washing of the priest's hands and that of the sacred vessels. On the same side, but to the west, is a sedilia, divided into three seats, for the officiating clergy at the sacrifice; and on the north side, in the case of a cathedral church, the bishop's throne is now placed; anciently it was placed behind, and higher than, the altar.

The term is, however, frequently used to denote the sanctuary only, as distinguished from the choir.

Ch. Rohault de Fleury, *La Messe, Études Archéologiques*, 8 vols. (Paris, 1887); Albert Lenoir, *Architecture Monastique* (Paris, 1852); and X. B. de Montault, *Construction de l'Ameublement et Décoration des Eglises* (Paris, 1885). — C. C.

High Chancel. The central or principal part of a chancel in a large church where there are aisles or a deambulatory. The need of the term comes from the confusion between the use of "choir," "chancel," etc., to denote particular sacred enclosures, and the use of the same terms to denote the entire easterly division of the building.

CHANCEL AISLE. The side aisle of a chancel. In large churches having an apsidal end, the aisle usually passed around the apse, forming a deambulatory. In English churches having a square eastern termination the chancel aisle is often stopped short of the end of the chancel, and in some cases extends but one bay beyond the transept or chancel arch.

— A. D. F. H.

CHANCEL ARCH. An arch in the wall which, in many churches, separates the chancel or sanctuary from the nave or body of the church. (See Chapel; Choir; Church.)

Chancel of Staindrop Church, Yorkshire; about 1370 A.D.

Perpendicular style. [illegible]

CHANCEL BENCH. A bench, usually of stone, placed against the side of the chancel, either externally or internally, as in some old [illegible]. Benches in the chancel apparently took the place of more elaborate stalls.

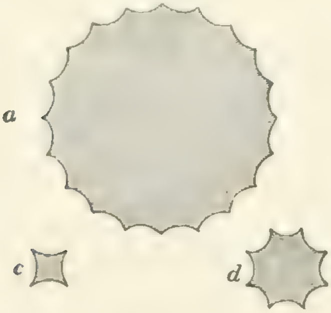
CHANCEL RAIL. The railing or barrier in place of a chancel screen by which the chancel is separated from the nave. Where no subdivisions of the chancel exist, the chancel rail may assume the functions of an Altar Rail.

CHANCEL SCREEN. Properly, a screen separating the chancel from the body of the church. Frequently applied to a screen separating the sanctuary from the choir, the term chancel being then applied to the sanctuary only. Chancel screens in this latter sense are to be found in large churches; or in those monastic churches in which the choir is much the most important part of the interior. In ordinary cases there is no such separation, and the term is continually used for choir screen. (See Choir Screen and references.)

CHANCERY. *A.* The room, set of rooms, or house occupied by an official bearing the title of chancellor. Hence, by extension, the offices of a chancellor and his assistants.

B. The room or set of rooms employed for the business uses of an ambassador, a minister plenipotentiary, or similar diplomatic representative of a government. In the house of an ambassador, the rooms where his official business is done bear this name.

CHANNEL. Any furrow or groove, whether for carrying off water or for any other purpose. A street gutter is in England sometimes called a channel. In Greek Doric architecture it is applied to the grooves of the triglyphs and columns; those of the columns being called by this name to distinguish them from the flutes of the Ionic and Corinthian orders; though this distinction is not always maintained.



CHANNELLING.

a Showing in plan the typical Doric column. *d* Plan of a shaft in the cathedral at Monza, Lombardy, Italy. *c* A section rare in architecture, except occasionally in late Gothic.

CHANNELLING. The breaking up of a surface by means of channels or grooves, usually near together and parallel; channels collectively.

CHANNEL IRON. An iron or steel member shaped as a channel; especially one having the form of a small channel beam, which see under Beam.

CHANTEREL, JACQUES; architect (*maître d'œuvre*) and sculptor.

Chanterel appears in the records of 1555, 1556, and 1558 in association with Ambroise Perret in the decoration of the monument of François I., at Saint-Denis (see Philibert De l'Orme.) The fine cornice and the Ionic capitals are especially his work. In 1558 he contracted with Philibert De l'Orme to build the bridge and gallery of the Château of Chenonceau (France).

De Laborde, *Comptes des bâtiments du roi*; Palustre, *Renaissance*; Chevalier, *Château de Chenonceau.*

CHANTIER. In French, a workshop; in English, a shed to protect stone cutters or other workmen from the sun and rain.

CHANTLATE. A piece of wood fastened at the end of rafters and projecting over the wall, supporting rows of tiles to prevent rainwater from running down the walls (A. P. S.). (Compare Lookout.)

CHANTRY. *A.* A foundation or establishment for the daily or frequent saying of mass in behalf of the founder or some other person or persons.

B. The chapel or separate part of a church appropriated to the purpose of *A*, and commonly built or adorned by the founder. It is often a bay, or two or more bays, of an aisle, enclosed by a screen.

CHANTRY CHAMBER. A chamber for a chantry priest.

CHANTRY CHAPEL. Same as Chantry, *B.*

CHANTRY, SIR FRANCIS LEGATT, R. A.; sculptor; b. April 7, 1781; d. Nov. 25, 1842.

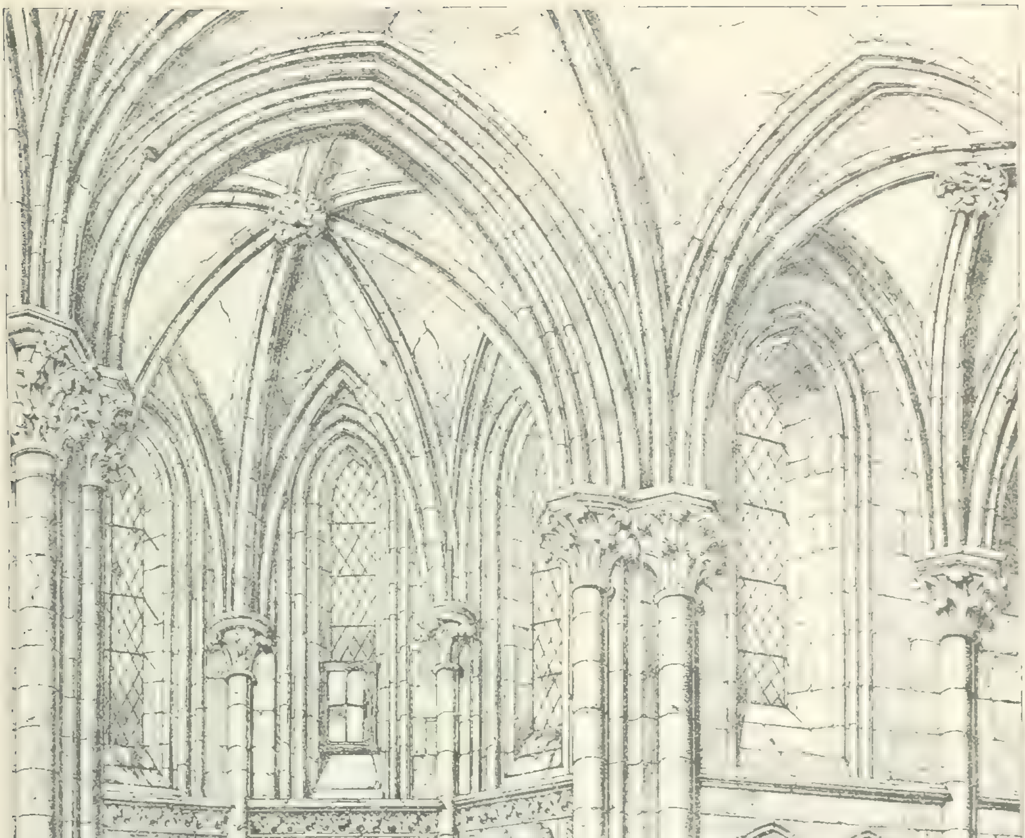
The sculptor Chantry made the equestrian statue of George IV. in Trafalgar Square (London), the statue of the Duke of Wellington in front of the Royal Exchange, and numerous monuments in Westminster Abbey and elsewhere.

Redgrave, *Dictionary of Artists.*

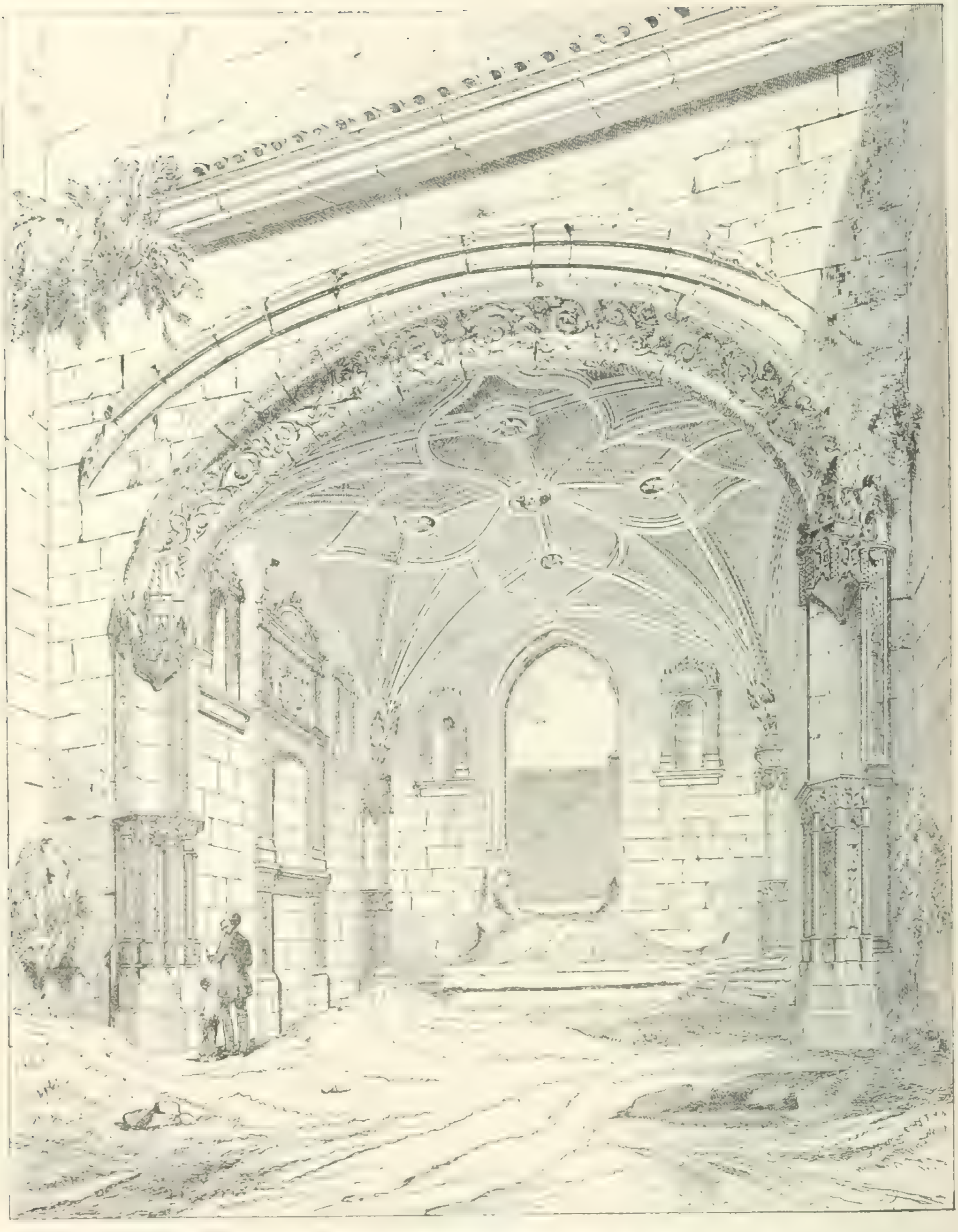
CHAORI. A large porch to a Brahman temple in India, used especially for marriage ceremonies. It is sometimes identical with the *Mantapa*, and sometimes precedes it, forming in area the largest feature of the temple.

CHAPEL. A place of Christian worship differentiated from a church in one of several ways, — either as being smaller, or as of a sect or rite not the established one of the nation; or as being accessory, either attached to a larger building, or dependent upon it or its foundation. Specifically:

A. A place of worship, not the principal church of a parish or of a diocese; in this



CHAPEL IN SOUTH AISLE OF CHOIR, CHURCH AT NORREY (CALVADOS), FRANCE



CHAPEL: CHAPELLE DE L'EVÊQUE, PERIGUEUX (DORDOGNE), FRANCE.

sense, Protestant places of worship in Catholic countries, or the like, are called chapels; and, in England, buildings of the Dissenters.

B. A structure built in connection with a church and opening from it. Along the aisle of a large church it is customary to build chapels opening from the aisle like bay-windows; either closely adjoining one another, as on the sides of the nave aisles, or forming absidioles around the chevet of the east end. The addition of these to large Gothic churches forms often one of their principal architectural features. Some chapels are so large as to form buildings of separate design (see Lady Chapel below). Sometimes one bay, or in rare cases a still larger space, is screened off and used as a chapel. (See Chantry, *B.*)

C. A place of worship attached to a public building or large dwelling; often an oratory, but more rarely a separate building like a church. S. Mark's church in Venice was the chapel of the Doge until the present century, and the S. Chapelle at Paris was the chapel attached to the ancient palace of the king.

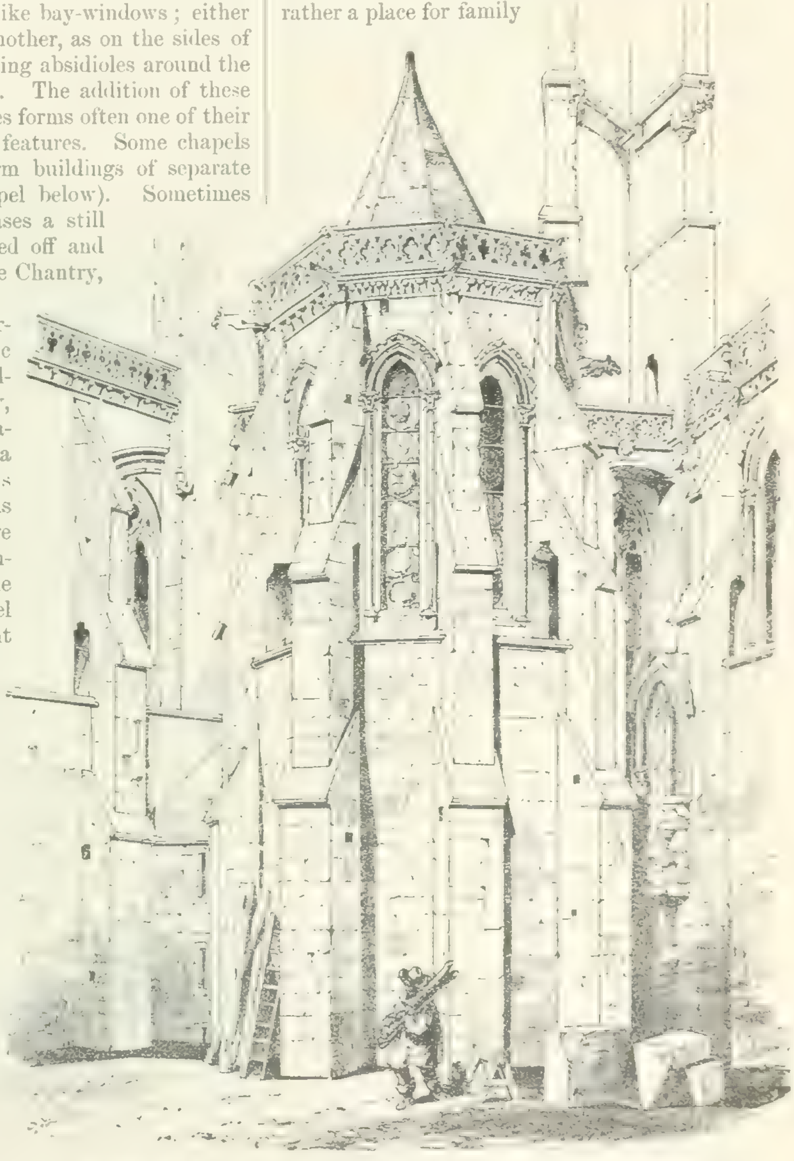
R. S.

Arena Chapel. A small ancient chapel in Padua, North Italy, decorated with important paintings by Giotto. Its popular name comes from its situation on part of the ground once occupied by the Roman amphitheatre (arena).

Chantry Chapel. Same as Chantry, *B.*

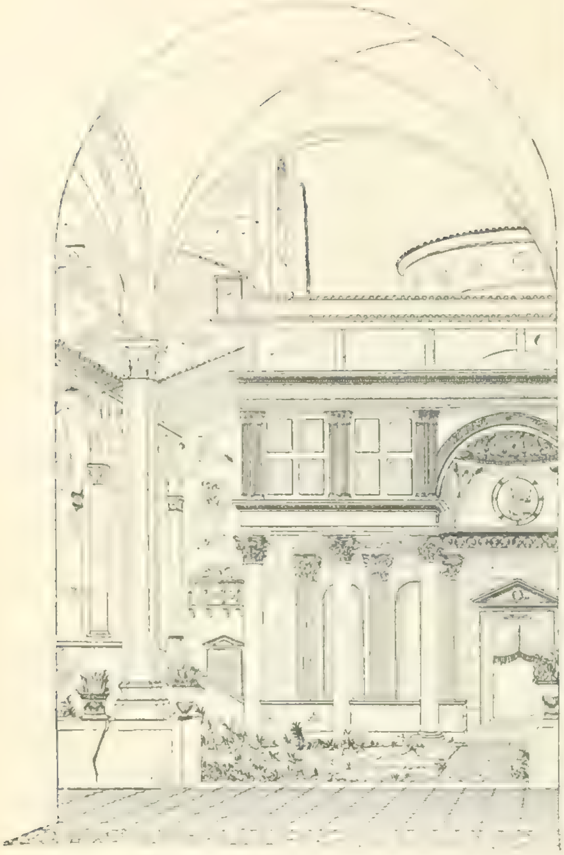
Colleoni Chapel. A chapel attached to the cathedral of Bergamo in Lombardy, and built in his old age, about 1470, by Bartolommeo Colleoni, that soldier of fortune whose equestrian statue by Verrocchio stands in Venice in front of the church SS. Giovanni e Paolo.

Domestic Chapel. One attached to a private mansion, not necessarily within the walls of the main building, but under the special control of the owner. The Dictionary of the A. P. S. makes a distinction between this and the oratory, or *private* chapel, which seems to apply only in Great Britain. It appears that the domestic chapel may be administered by an incumbent acting under the direction of the bishop of the diocese, while the oratory or private chapel would be rather a place for family worship, where the service provided in the prayer-book for that purpose is the only one used. (Cut, col. 519.)

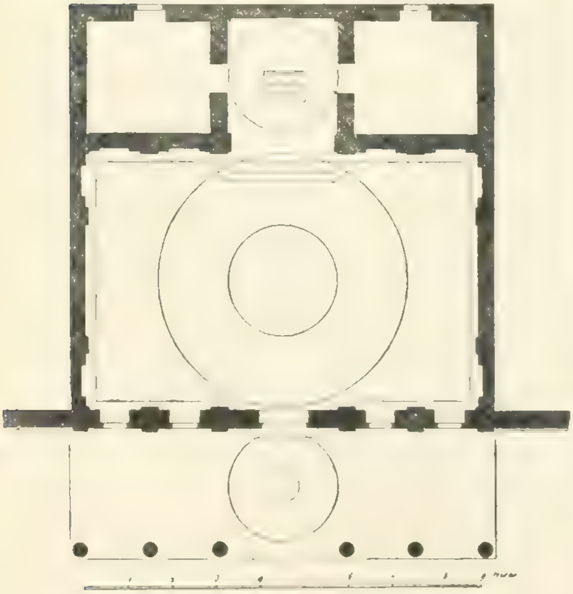


Chapel of Choir, Cathedral of Le Mans (Sarthe), France.

Expiatory Chapel. In Paris; erected by Louis XVIII.; finished in 1826 from the designs of Percier and Fontaine. It commemorates Louis XVI. and Marie Antoinette and the other royalist victims of the Revolution, including the soldiers killed in the defence of the



Chapel of the Pazzi, Church of S. Croce, Florence, Italy. (See Plan.)



Chapel of the Pazzi: Plan. (See Cut.)

Tuileries, and the site is chosen as being the place where the king and queen were buried in 1793, in the then burial ground of the Madeleine, the modern Boulevard Haussmann passing close to its walls. The exterior of the building is a fantastic study of ancient funeral monuments, but it is solidly built and vaulted, and is a costly monument.

Free Chapel. A chapel founded apart from the regular ecclesiastical authority. The tendency of modern times has been to put an end to these.

S. George's Chapel. At Windsor; the principal chapel of Windsor Castle; a magnificent building of perpendicular architecture, with one of the three finest fan-vaulted roofs in existence. It was built at the close of the civil wars, begun by Edward IV. and finished by Henry VIII. It has the dimensions of a large church, 232 feet in length and 104 feet at the transept. The chapel serves especially for the Order of the Garter, and the stalls of the knights are arranged along the sides of the choir.

Henry the Seventh's Chapel. A large chapel opening eastward from the architectural choir of Westminster Abbey, — that is, from the ambulatory which passes around Edward the Confessor's Chapel. The chapel is in itself an important church of the latest perpendicular Gothic, with a magnificent fan-vaulted roof, one of the three most important in England. (Compare King's College Chapel below; S. George's Chapel.) It contains the tomb of Henry VII. and his queen, in bronze, with statues by the Italian Torrigiano. The stalls around the chapel are those of the Knights of the Order of the Bath, above, and the Squires on a lower level.

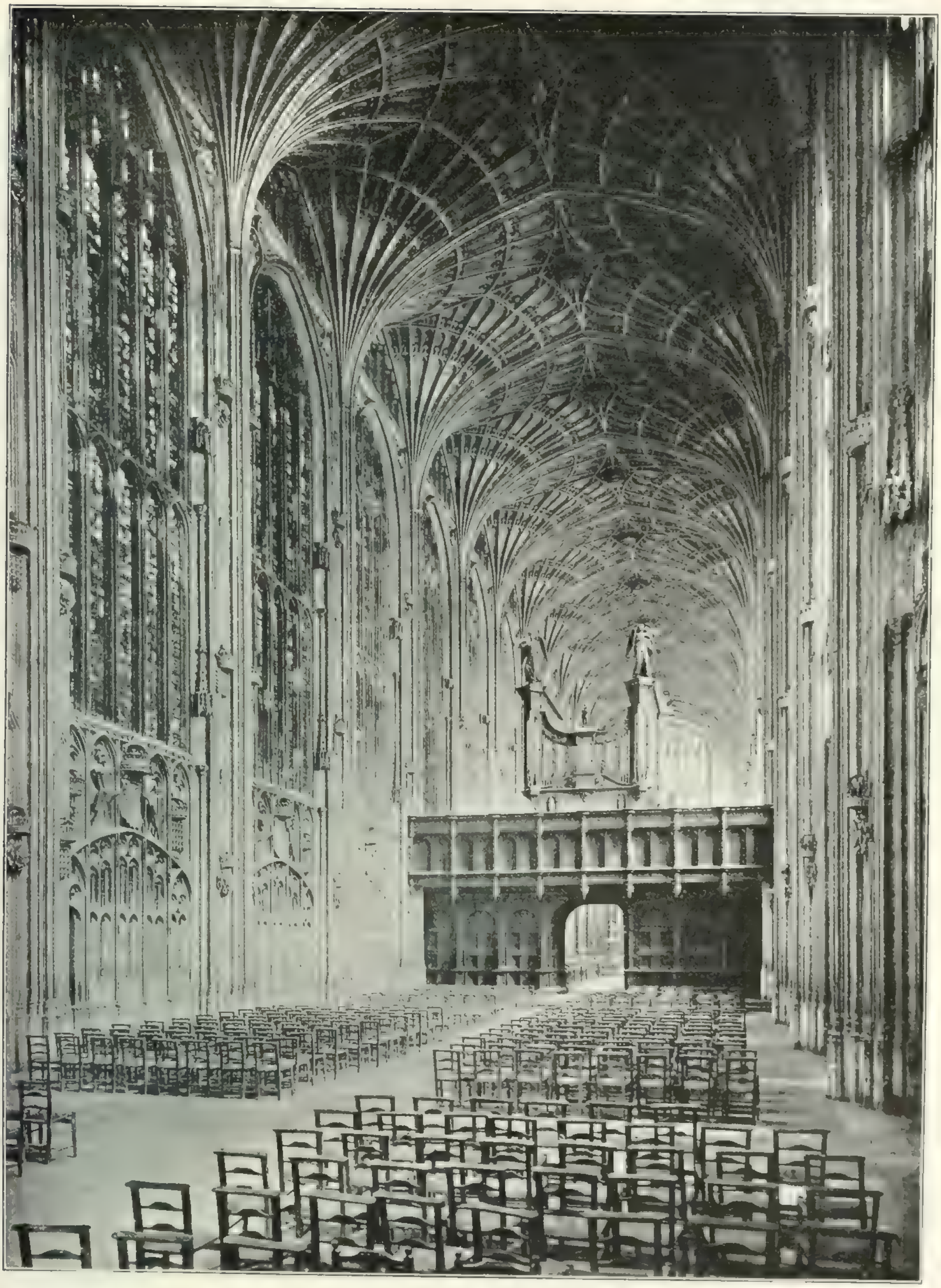
King's College Chapel. (See under College.)

Lady Chapel. A chapel dedicated to the Virgin; especially, in England, one connected with a cathedral, Such chapels are often attached to the choir, and either form a prolongation of it to the east or form a building like a separate small church with a covered passage connecting it with the main church.

Mortuary Chapel. A chapel containing a tomb and having an altar at which masses for the dead are said, or, in modern times, a chapel connected with a family vault, or in a cemetery, the term being used loosely.

Parochial Chapel. In England, one for the parishioners of a large parish, but differing from a chapel of ease in that it is, or represents, the church of an old parish which has been united to another.

Pauline Chapel. (*Cappella Paolina.*) In the palace of the Vatican, near the Sistine Chapel, and, like that room, opening out of the *Sala Regia.* It was built by Pope Paul



CHAPEL

That of King's College, Cambridge, England. This interior, roofed by one of the three great fan vaults of England, may be thought finer in effect than any cathedral interior in the island. Its dimensions are great for a single unbroken room, nearly eighty feet in height to the crown, with a width of forty-five feet, and a total length of about three hundred and ten feet inside the walls. The value of monotony, or the long continued repetition of similar parts, is nowhere shown more effectively. The building was begun under Henry VI, and carried on by his rival, Edward IV, when in power, but the fan vaulting and the decoration are generally of the time of Henry VII, and of the developed Tudor style.

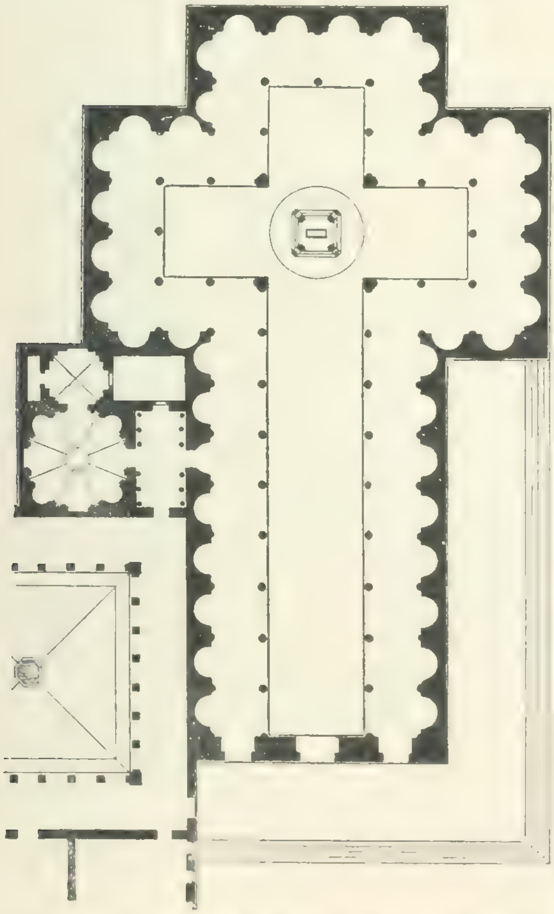
III., about 1540, and contains important frescoes by Michelangelo.

Private Chapel. (See Domestic Chapel above.)

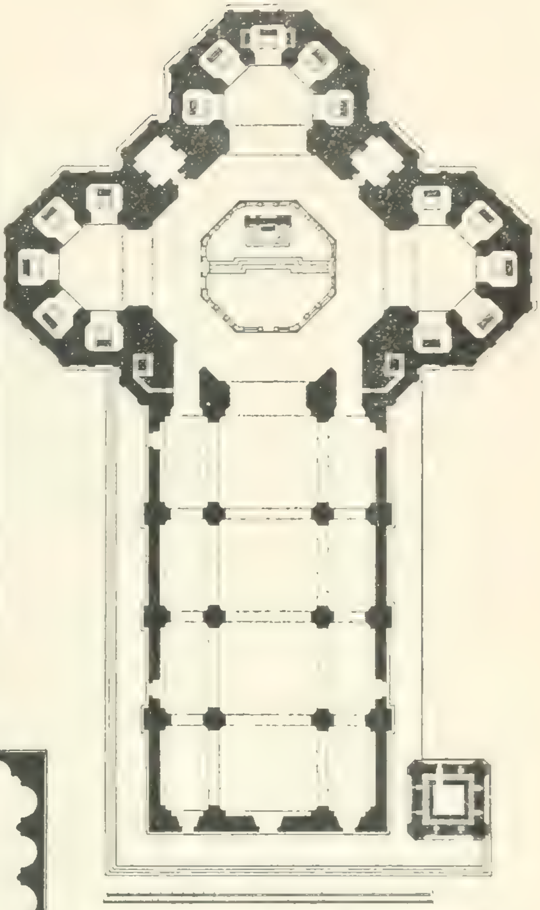
Proprietary Chapel. In England, a place of worship belonging to an individual, where service is held according to the forms of the established church. Differing from a private chapel in that it is open to all who choose to hire sittings.

Sepulchral Chapel. (Same as Mortuary Chapel above.)

Sistine Chapel. (Called also Sixtine Chapel, *Capella Sistina*); in the palace of the Vatican, built by Pope Sixtus IV toward the close of the fifteenth century. The room is extremely plain, 50 feet wide and about 147 feet long, roofed in the Italian manner with a vault of generally three-centred section, which vault is broken by subordinate vaults, two at each end and six at each side; the lunettes so produced containing windows. The room stands nearly east and west; on the eastern end is painted “The Last Judgment,” by Michelangelo, and the whole roof, as well as the lunettes, is covered with his frescoes. On the side walls, below the windows, is a row of paintings by Sandro Botticelli, Cosimo Rosselli, Perugino, Ghirlandajo, and by Lucca Signorelli as has been generally assumed, though this last ascription is now disputed. — R. S.



Chapel: Church of S. Spirito, Florence, with Niches used as Chapels in the Outer Walls.

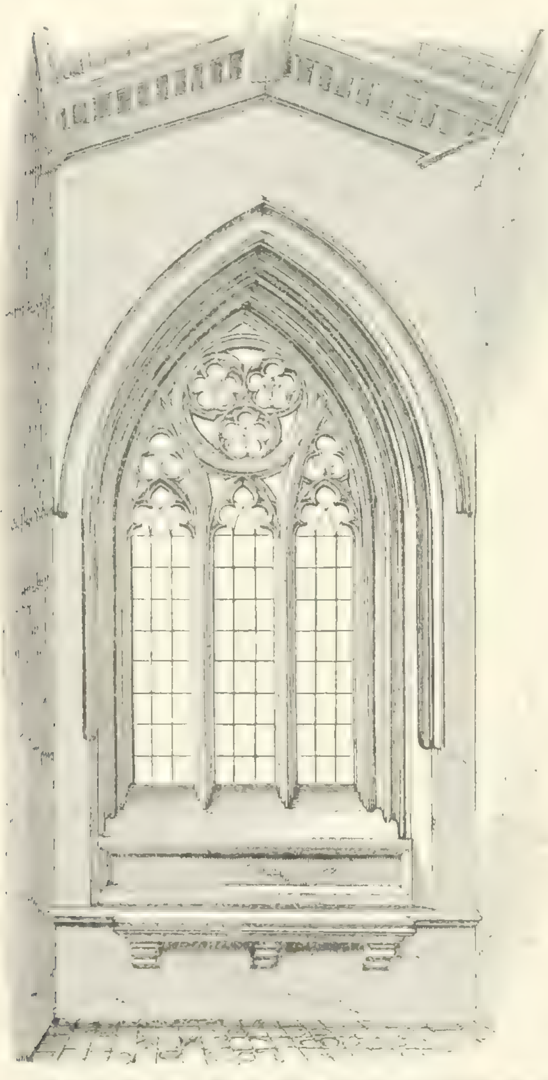


Chapel: Cathedral of Florence, with Fifteen Apsidal Chapels forming externally a Larger and Lower Octagonal Projection of Each Apse.

S. Stephen's Chapel. In London; adjoining Westminster Hall; was burned in the fire which destroyed the Houses of Parliament in 1834. The crypt of it was refitted and decorated during the present century, and is entered by a door leading from the platform at the upper or southern end of Westminster Hall. It is kept up as the Chapel of the Houses of Parliament, in and about which there are many official residences, and which has as many inhabitants as a large village. The present S. Stephen's Hall, which is the public passage from Westminster Hall eastward to the Central Hall, between the House of Peers and the House of Commons, very nearly represents the upper or principal story of the ancient S. Stephen's Chapel.

Wayside Chapel. A small chapel maintained at the side of a road or highway for the benefit of pilgrims, travellers, or other wayfarers.

CHAPEL OF EASE. In England, a church built within the bounds of a parish for the attendance of those who cannot conveniently reach the parish church.



Domestic Chapel, Broughton Castle, Oxfordshire; the East End.

CHAPEL ROYAL. The banqueting house at Whitehall, London, used as a chapel since the time of George I.

CHAPITER. Same as Capital.

CHAPLET. A bead moulding carved into the semblance of a string of beads or pearls; a carved astragal or baguette.

CHAPTER HOUSE. A room, often forming a separate building, in which meets the chapter of a cathedral or conventual establishment; corresponding to the French *Salle Capitulaire.* Those of the English cathedrals are often very effective pieces of architecture, and the octagonal houses with central pillars, of York and other cathedrals, and of Westminster Abbey, are remarkable pieces of Gothic decorative building. That of Westminster Abbey is about 54 feet in diameter between two opposite sides; its central pillar is 35 feet high, and the height to the crown of the vault is 54 feet. (Cut, cols. 521, 522.)

CHAPTER ROOM. *A.* Same as Chapter House.

B. A room provided for the stated meetings of a chapter in its proper sense of an assembly of canons or members of an honorary order; hence, by extension, the place of meeting of a branch or suborganization of a large association. (Cut, cols. 523, 524.)

CHAPTREL. *A.* A small capital.

B. A capital not projecting on all sides, as of a pilaster or vaulting shaft.

CHAPU, HENRI MICHEL ANTOINE; sculptor; b. Sept. 29, 1833 (at Lemée, Seine-et-Oise, France); d. April 15, 1891.

He won the *Premier Grand Prix de Rome* in 1855. Among his best works are "La Jeunesse," a figure for the monument to Henri Regnault at the *École des Beaux Arts* (1875), "La Pensée," a figure for the monument of Daniel Stern (1877), the monument to Mgr. Dupanloup at Orléans (1887), and the statues of Pluto and Proserpine at the château of Chantilly (1884), etc.

Vapereau, *Dictionnaire universel des Contemporains*, 1893; F. Courboin, article *Chapu* in *La Grande Encyclopédie*.

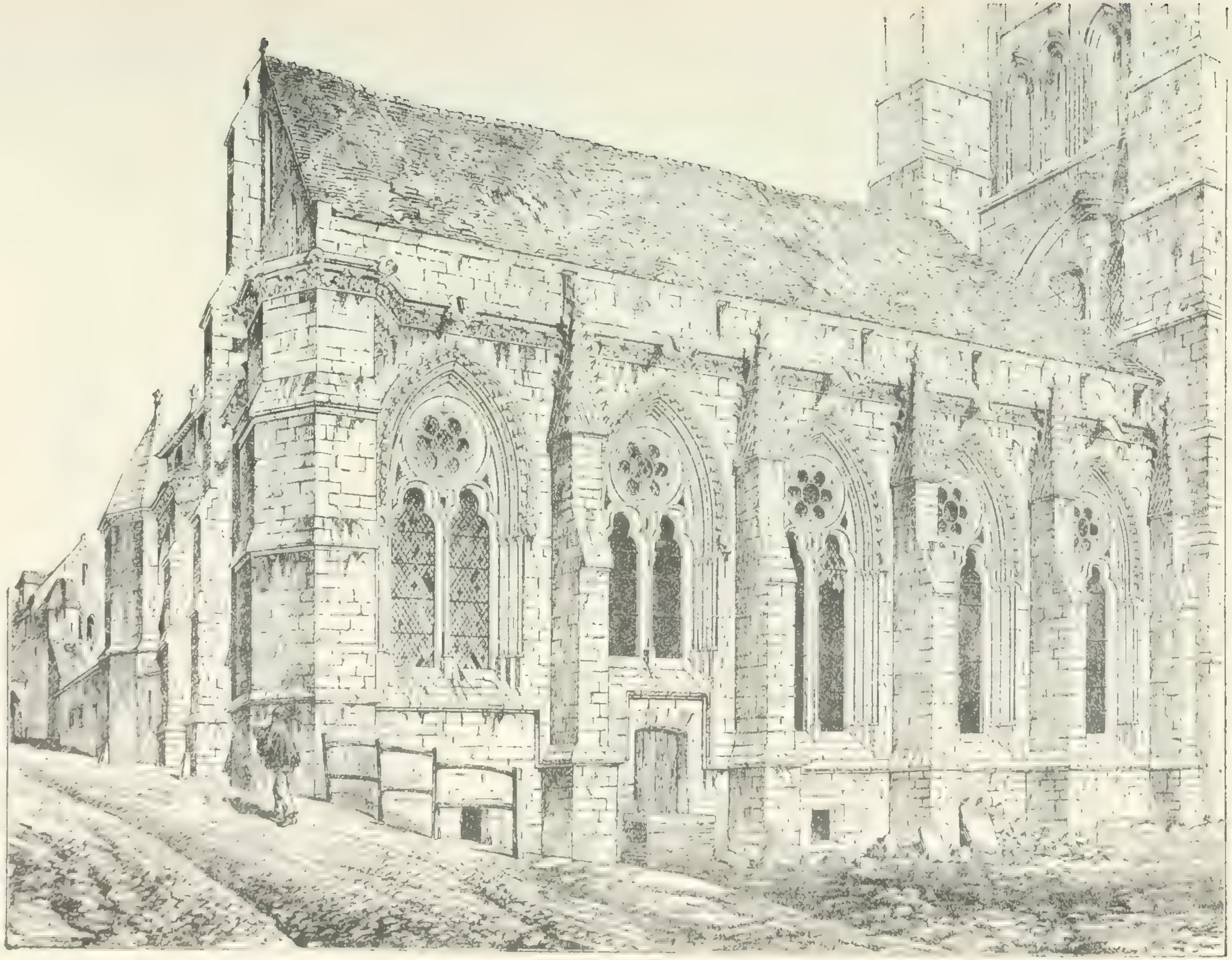
CHAPUY, NICOLAS MARIE JOSEPH; architect and lithographer; b. 1790 (at Paris); d. July 23, 1858.

Chapuy assisted in the preparation of the great *Voyage pittoresque et romantique dans l'ancienne France* by Ch. Nodier, Baron Taylor, and Cailleux (20 vols., folio, Paris, 1820–1878), and the *Voyage en Orient* by the Marquis Léon de Laborde. In 1823 he brought out his series of the *Cathédrales de France*, with historic text by F. T. de Jolimont.

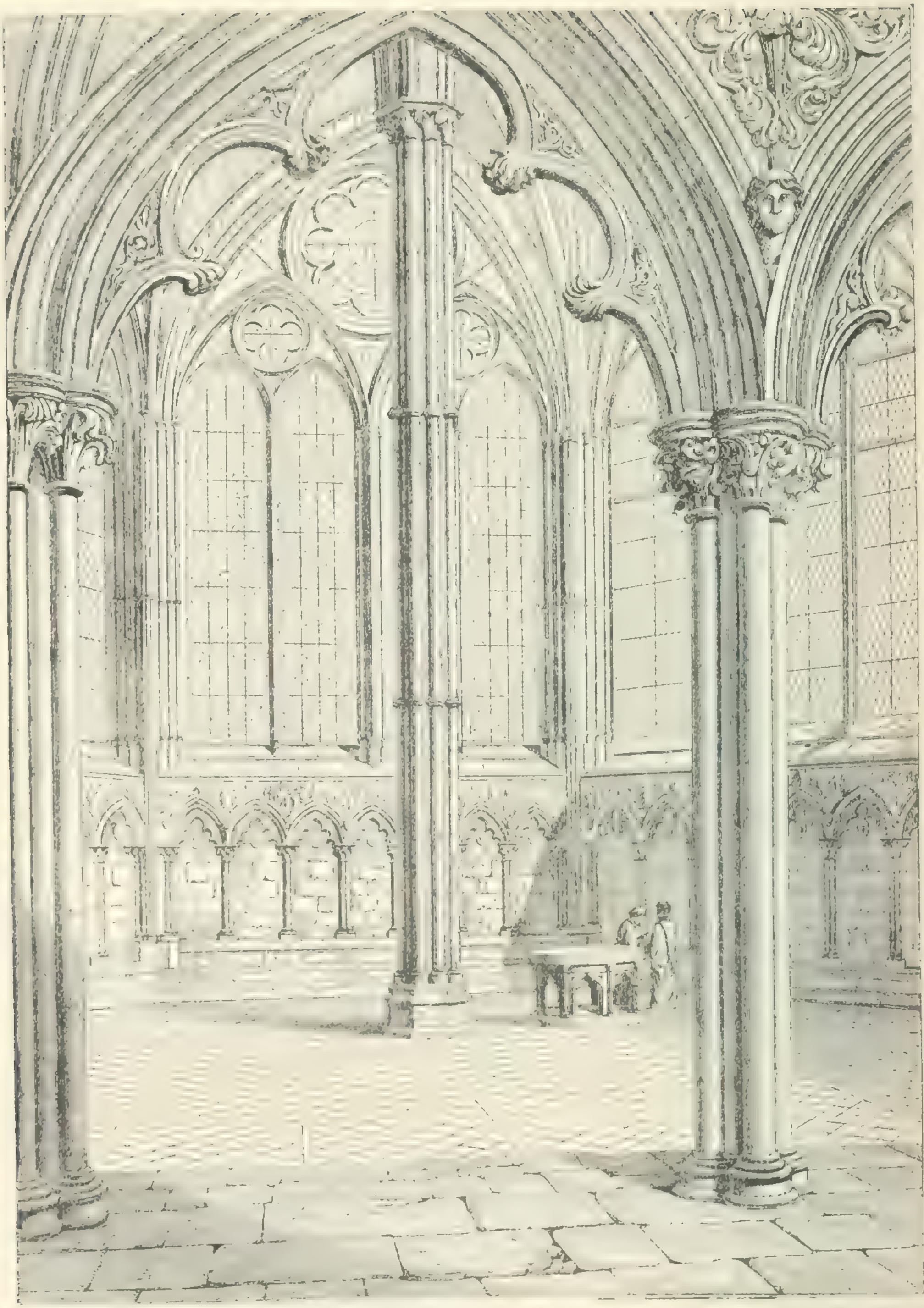
Bellier de la Chavignerie, *Dictionnaire des Artistes*.

CHARES OF LINDOS (in the island of Rhodes); Greek sculptor.

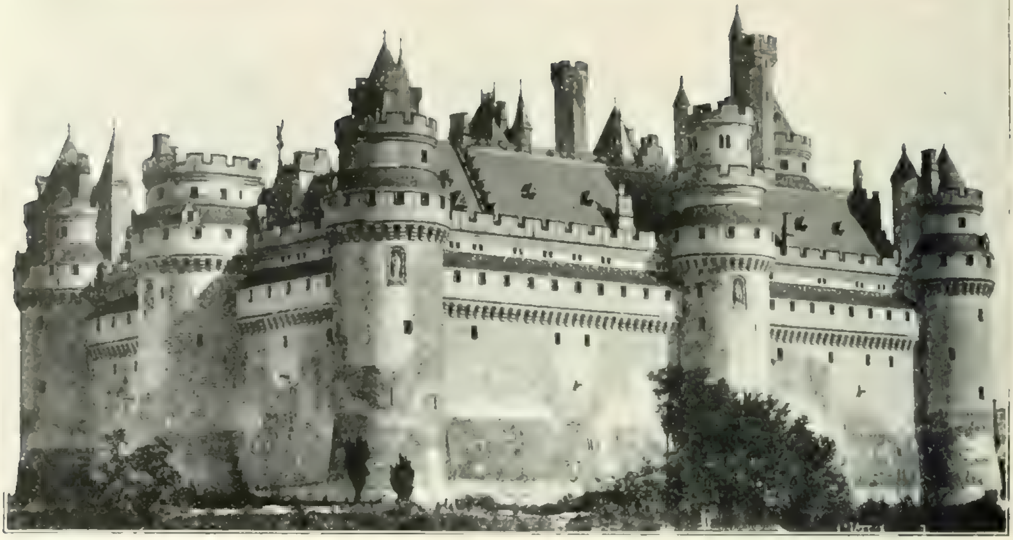
Chares was a pupil of Lysippus (see Lysippus), and is especially famous for the colossal statue of Helios (the Sun God) which he erected

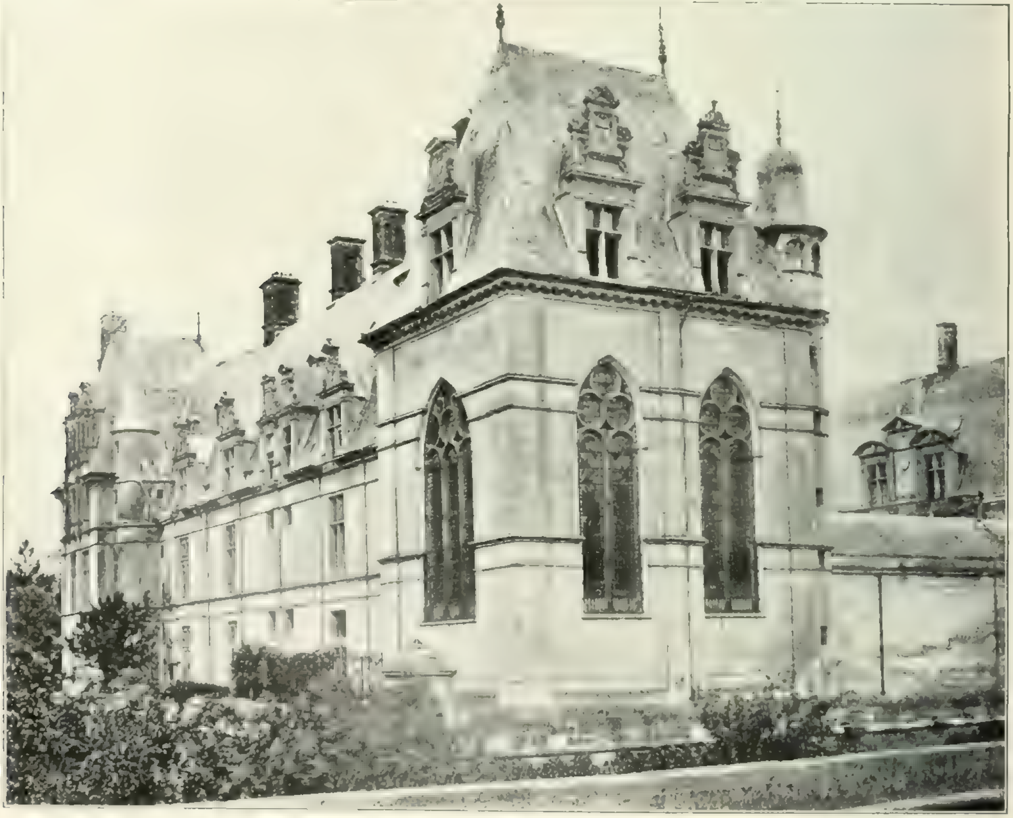


CHAPTER HOUSE OF THE CATHEDRAL OF NOYON (OISE), FRANCE; WEST SIDE.



CHAPTER ROOM OF SALISBURY CATHEDRAL.





CHÂTEAU

(Upper figure.) That of Pierrefonds, northeast of Paris, and the most elaborate and perfect specimen of a feudal château which exists. It was built at the close of the fifteenth century; dismantled by command of Richelieu, and repaired by order of Napoleon III, and at great cost. The restoration includes much unwarranted modern work in the way of decoration, but the planning, disposition, and arrangements for defences are entirely trustworthy.

(Lower figure.) That of Écouen, northwest of Paris. It was built in the sixteenth century by Jean Bullant, and its exterior has remained unchanged. The pavilion in the foreground is the chapel, retaining in an odd way features of Gothic architecture, not only in the pointed windows, but also in the vaulting within. On the right is the low building which closes the fourth side of the great court; the other three sides being faced with buildings not unlike those seen on the left in the picture.

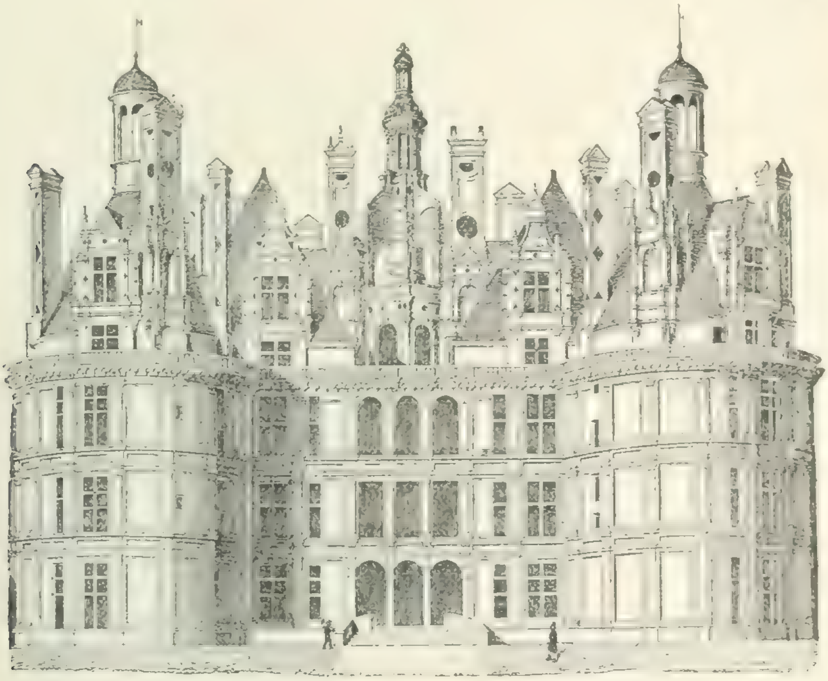
at Rhodes and which was called one of the seven wonders of the world. This statue, 105 feet high, was paid for by the sale of war machines which Demetrios Polyorketes abandoned when he was obliged to raise the siege of Rhodes in 303 B.C. After standing sixty years it was thrown down by an earthquake.

CHARGED. Adorned with, or bearing, something else; used of architectural features or members which bear decorative forms in relief designed independently of the charged surface, as rosettes, escutcheons, masks, etc. The term is adopted from the heraldic science of armorial bearings. (See Arms.)

CHARTREUSE. In French, a Carthusian monastery corresponding to the Italian *certosa*. (See Monastic Architecture.) The building most commonly mentioned under this name is La Grande Chartreuse in the mountains near Grenoble (Isère). (See Certosa; Monastic A.)

CHASE. A groove or channel formed in a structure, as in the face of a wall, to receive some accessory such as flues, wires, sliding weights, or the like. A chase may be left in a wall for the future joining to it of an abutting wall to be built later. A chase differs from a groove mainly in being relatively large, and in not ordinarily calling for accurate fitting to whatever it is to receive.

— A. D. F. H.



Château of the French Renaissance: Central Mass of Chambord; 1525 to 1540. (See Plan.)

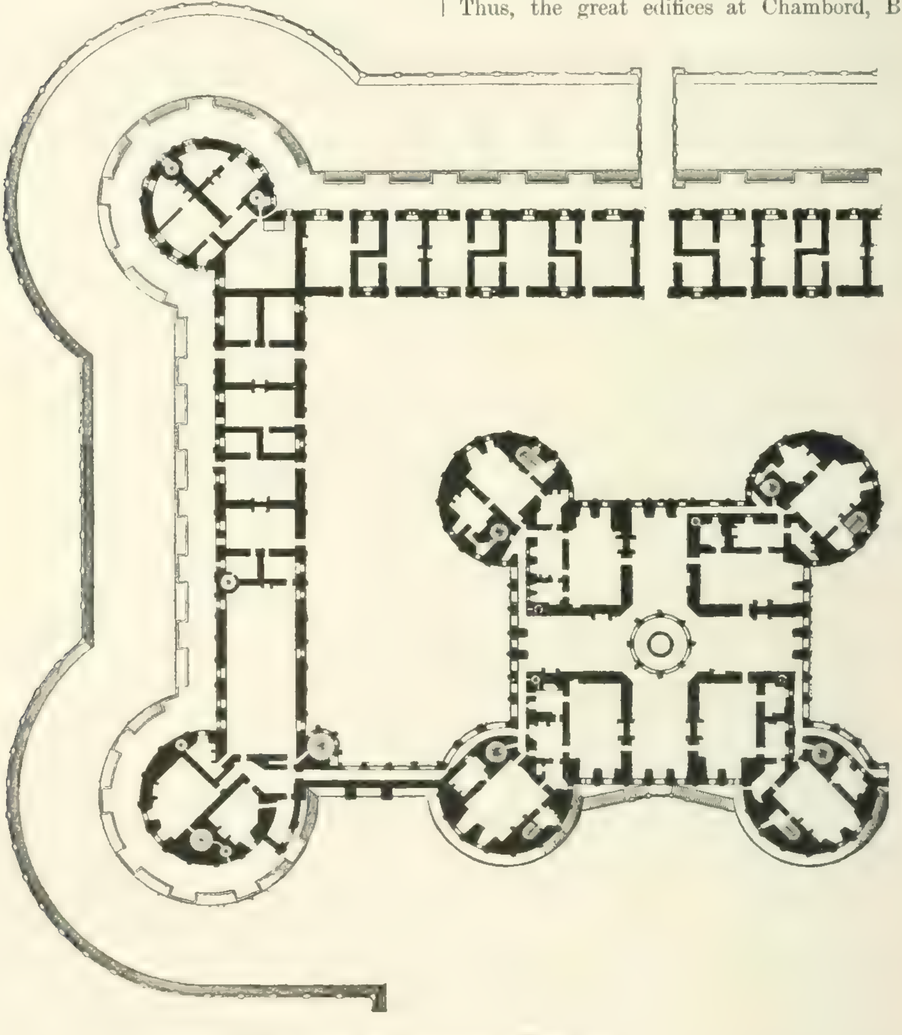
CHARNEL HOUSE. A place of deposit for dead bodies in connection with a mediæval church; in particular, one to which bodies were consigned until desiccated or reduced to mere skeletons which could then be removed to the ossuary or bone house. The crypt of a church was sometimes used as a charnel house; and a special chapel was often provided above the charnel. (See Ossuary.)

CHARTER HOUSE. A Carthusian monastery, the term being a mispronouncing of the French *chartreuse*.

Especially, a famous foundation school formerly occupying the site of an old monastery in London, now removed to the country.

CHARTOPHYLACIUM. A place for the safe keeping of records and other valuable documents (late Latin ecclesiastical term).

CHÂTEAU. In lands where the French tongue is spoken, the residence of the feudal lord of the soil. This, of course, was a fortified dwelling; and throughout the Middle Ages the château is exactly the same thing as the English castle during the same epoch. In modern times the phrase Château-fort is used to describe one of those strong castles. Châteaux built since the beginning of the sixteenth century are not, therefore, fortified in any serious way: those of the sixteenth century being still surrounded by a deep ditch which enclosed gardens and stables as well as the buildings proper, and those of later times, mere country houses, without even a strong outer wall. The term is given even to a rather small and unimportant dwelling house, if it is the residence of the owner of considerable landed property. Thus, the houses of owners of vineyards in the wine-growing regions of France give names to the superior wines grown in the vineyards of the proprietor, as in the names Château Lafite, Château Yquem, etc. It is notable that this use of the term does not prevail in the famous wine growing region of Burgundy, where, although the building may be called a château by the neighbours, it does not give that name to the produce of the vintage.



Château of Chambord. (See Cut.)

The term château is applied, therefore, to modern French country houses to an extent far greater than the English word castle. The latter is used only as part of a time-honoured name and in a few cases, whereas in France a house built during the present century where no previous building of the kind has ever existed, is called château as a matter of course. There is, therefore, no particular type of dwelling to be described as peculiarly a château, but good specimens may be mentioned; such as the château of Josselyn in Brittany, as an instance of the large buildings of the sixteenth century; the château of Bussy-Rabutin, as a building of the seventeenth century; and the Château of Maisons-sur-Seine, as an instance of a quite modern building.

It is to be noted that the word château is applied to royal palaces in France, and that the word *palais* is rare, used in this sense. Thus, the great edifices at Chambord, Blois, and Amboise are called simply royal châteaux; and the Louvre, in Paris, is the royal château upon which all the fiefs in the country depended during the continuance of feudality. (See Palais.)

For the books concerning the strong castles of the Middle Ages, see Castle; for the great manor houses of the Renaissance, see bibliography under France; also Petit, *Les Châteaux de la Vallée de la Loire*, Paris, 1861.

CHÂTEAU D'EAU. An artificial cascade architecturally treated; often a structure of considerable pretensions from which the water emerges. It is probable that this treatment of cascades originated with the Romans; it was carried to great perfection in the villas of the Italian Renaissance and Decline; and in modern times has been most successfully applied by the French. The most celebrated Italian examples are that of the Villa d' Este (Tivoli); the Fontana di Trevi (Rome, 1743, by Ferdinando Fuga); and that of the Caserta palace (1753, by Van Vitelli), the latter the most magnificent of all. In France, good examples are at Saint-Cloud, the Trocadéro in Paris, and the fountain of Longchamps at Marseilles. — A. D. F. H.

CHÂTEAU, GUILLAUME DU. (See Guillaume du Château.)

CHÂTEAUX OF THE LOIRE. Those of peculiar importance, historical and architectural, in the departments of Loire, Loir-et-Cher, and Indre-et-Loire, and situated not far from the river Loire. Some are royal châteaux and now belong to the nation, such as Amboise, Blois, and Chambord; but Azay le-Rideau, Châteaudun, Chaumont, Chenonceaux, Longeais, and Romorantin are private property. These are all of the French Renaissance. The name is sometimes extended to some earlier, and now ruined, buildings, such as Chinon and Loches.

CHAVANNES. (See Puvis de Chavannes.)

CHECK (I.). A crack or split caused by the uneven shrinkage of wood while seasoning or drying. It is to guard against checks that lumber is quarter sawed, and large sticks, especially posts, have their hearts bored out.

CHECK (II.). In masonry, a rabbet-shaped cutting along an edge of a stone by which it is made to fit another stone adjoining. Commonly used in uncoursed and random-coursed masonry, to reduce the height of a stone at one end to correspond with an adjoining stone of less height, so that the next stone above or below will overlap the two, breaking joints. (See Masonry.) Used also in sense of Pien Check (which see below).

Pien Check. In a stair constructed with hanging steps of stone, a check along the lower front edge of a step by which it fits the back of the step next below. (See Step.)

CHECKER. *A.* Any decoration which divides a surface into equal squares treated alternately in different ways, as with different colours or with high and low relief.

B. A form of diaper ornament in which the compartments are uniformly square, as in late Romanesque and in Gothic surface carving.

C. With the article, one of the squares in checker work.

CHEEK. A narrow upright face forming the end or side of an architectural or structural member. Usually, one of two corresponding opposite faces, whether forming the sides of an opening, as the jambs of a doorway, or forming the two side faces of a projection, as a buttress or chimney breast.

The term is often extended to mean an upright member or piece forming such a face, and this definition is accepted by the dictionaries, although the meaning given above appears to be the more accurate. — D. N. B. S.

CHEIROCRATES. (See Deinocrates.)

CHELLES, JEAN DE; architect and sculptor.

From the commencement of the cathedral of Notre Dame (Paris), in 1163, the name of no architect connected with the work is known until 1257, when the southern arm of the transept was enlarged and the southern portal built, which bears the inscription, ANNO · DNI · M. CCLVII. MENSE · FEBRVARIO · IDVS · SECVNDO · HOC · FVIT · INCEPTUM · CRISTI · GENITRICIS · HONORE · KALLENSI · LATHOMO · VIVENTE · JOHANNE · MAGISTRO. The rose window above appears to belong to the thirteenth century. The chapels of the nave, built between 1245 and 1250, may be his work. The northern portal has been ascribed to him, but was probably built about 1313. (See Chelles, Pierre de.) A Jean de Chelles was working on the old Louvre in 1265, under the direction of Raymond du Temple. (See Raymond du Temple.)

Bauchal, *Notre-Dame et ses premiers Architectes*; Viollet-le-Duc and Lassus, *Monographie de Notre-Dame*; Ministère de l'Instruction publique, *Inventaire général, Monuments religieux*, Vol. I.

CHELLES, PIERRE DE; architect.

It appears from the records of the cathedral of Chartres that Pierre de Chelles, *Maître de l'Œuvre de la Cathédrale de Paris*, and others visited the cathedral of Chartres as experts Sept. 9, 1316. They found that repairs were needed in the vault at the intersection of the nave and transept, in the buttresses, and in the Grande Tour. This Pierre was probably a son or brother of Jean de Chelles (see Chelles, J. de), and may have succeeded him as architect of Notre Dame (cathedral of Paris).

For bibliography, see Chelles, Jean de.

CHEMIN–DE–RONDE. In French, and by adoption in English, a continuous gangway behind a rampart; providing a means of communication along the walls of a fortified enclosure.

CHEOPS. The name, taken from the text of Herodotus, anciently given to the Egyptian king Khufu, the builder of the Great Pyramid of Ghizeh. (See Pyramid.)

CHERSIPHRON; architect.

Chersiphron of Knossos in Crete was the earliest architect of the great Ionic temple of Artemis (Diana) at Ephesus in Asia Minor, [illegible] Remains of this early temple were discovered by Wood in his excavations [illegible].

[illegible] *der griechischen Künstler*; [illegible]. Wood, *Ephesus*.

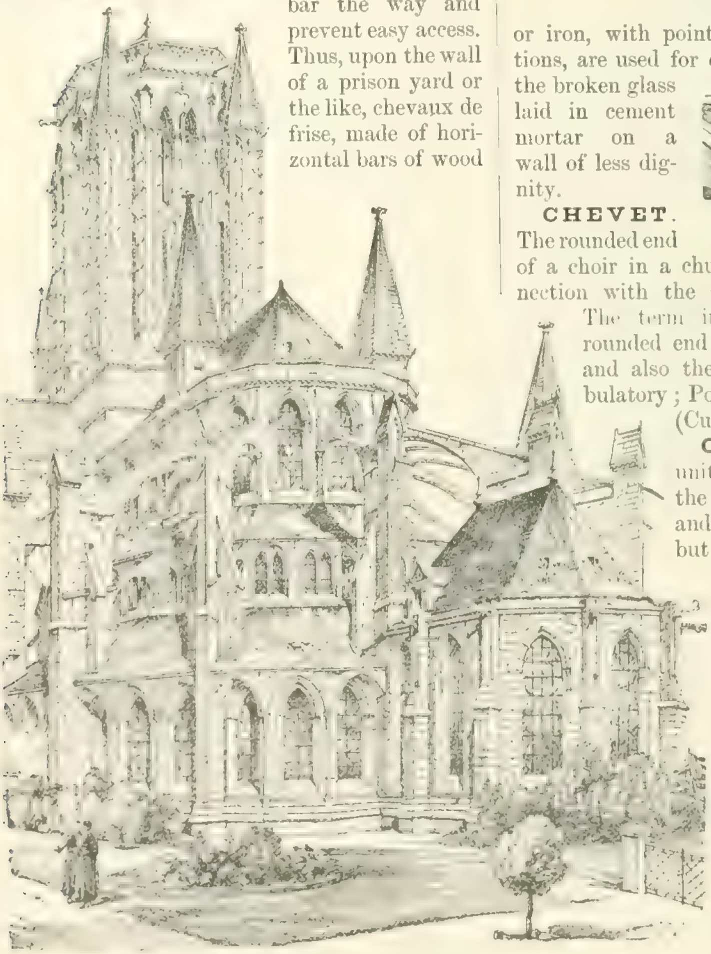
CHERT. A form of chalcedony; like flint, [illegible] in other rocks. — G. P. M.

CHERUB. *A.* A symbolic, or allegorical, decoration consisting of an infant's head with wings, common in late Italian seventeenth-century carving, and on English and American tombstones of the seventeenth and eighteenth centuries.

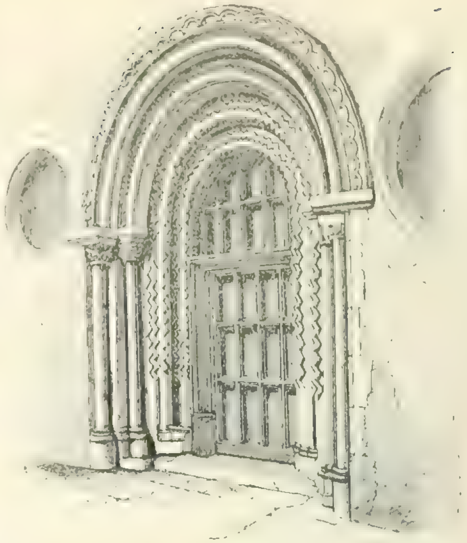
B. In the art of the sixteenth century and later, a naked child in any religious or liturgical representation. These figures are not often winged.

C. In ancient Jewish and in Byzantine art a symbolic figure with six wings, as on the Ark in Solomon's Temple, and on the pendentives of Hagia Sophia, Constantinople. — A. D. F. H.

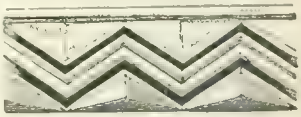
CHEVAL DE FRISE (pl. Chevaux de Frise). (Commonly used in the plural.) An assemblage of sharp points so arranged as to bar the way and prevent easy access. Thus, upon the wall of a prison yard or the like, chevaux de frise, made of horizontal bars of wood or iron, with points radiating in many directions, are used for exactly the same purpose as the broken glass laid in cement mortar on a wall of less dignity.



Chevet of Coutances Cathedral: General View from the Bishop's Gardens.



Chevron Moulding: Chapter House, Christ Church, Oxford.



Chevron Moulding.

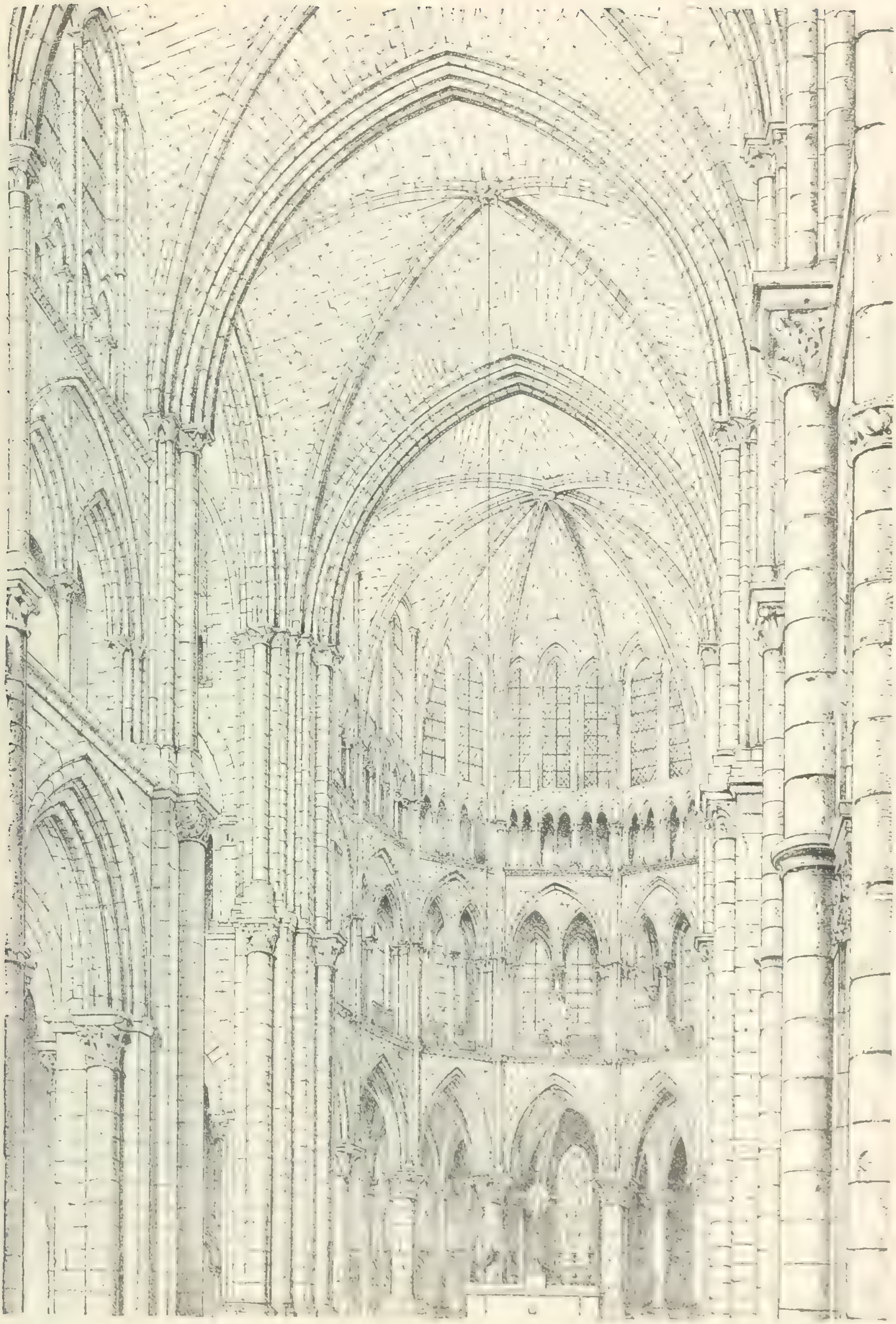
CHEVET. The rounded end of a choir in a church, especially used in connection with the Gothic churches of France. The term includes the apse itself, or rounded end of the central part or nave, and also the aisle or aisles (see Deambulatory; Pourtour) which pass around it. (Cut, cols. 533, 534.)

CHEVRON. An ornamental unit resembling an inverted V; the term is derived from heraldry, and there signifies a single Λ; but in architecture it is seldom used except as part of a chevron moulding.

CHEVRON MOULDING. A moulding adorned with chevrons, or zigzags, as in Norman and some Romanesque portals. The chevrons are usually of cylindrical section (whence the French name *bâtons rompus, i.e.* broken sticks), and alternately convex and concave.

CHILLENDEN, THOMAS; ecclesiastic.

Chillenden, prior of Canterbury cathedral from



CHEVET OF NÔTRE DAME AT CHÂLONS-SUR-MARNE. INTERIOR VIEW LOOKING EAST

34

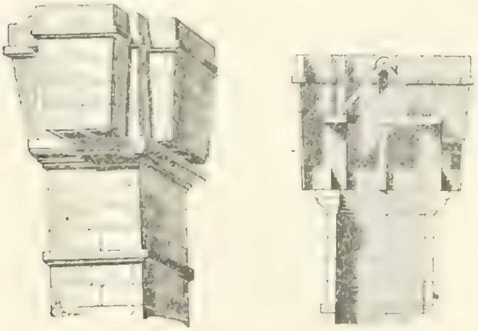
1391 to 1411, is supposed to have built, or to have superintended the building of, the nave, cloisters, and part of the chapter house of Canterbury cathedral. Archbishop Arundel (see Arundel, T.) contributed also to this work.

Britton, *Cathedral Antiquities.*

Chimney and Battlement, Cremona.

CHIMÆRA. A sculptured or painted representation of a non-natural monster, especially if of supposed formidable character. The term is a reminiscence of the legendary Chimæra of Lycia, but is not limited to representations of that creature as described.

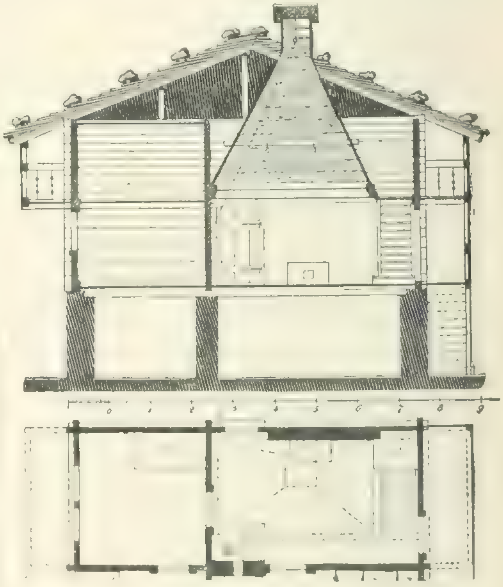
CHIME. A number of bells so proportioned to one another and so tuned that they are capable of being struck in harmony, producing a more or less elaborate piece of music. Chimes may consist of five, six, eight, or more bells; those consisting of many more being usually called Carillon. Chimes are commonly played in one of three ways, viz.: 1st, by machinery with a revolving drum, the projecting bands upon which drum catch the ends of wires connecting with the clappers or hammers; 2d, by means of a keyboard, the keys of which connect in like manner with the clappers, and which can be played upon by the musician below; 3d, by pulling the bell ropes, one person having charge of each bell, and these ringers being trained to act in concert under the direction of a leader. It is held by persons who are students of the subject that only the swinging of the bells in this third manner, with their mouths uppermost, is properly called chiming, or bell-ringing, all other devices being makeshifts. In certain parts of England, the clergymen in charge of parish churches have of late years organized bands of their parishioners for the chiming of their church bells. — R. S.



Chimney of the Mill of Mannfeeg, Switzerland.

Constructed of thin tiles set on edge to insure the least weight possible on the wooden framework which supports it.

CHIMNEY. That part of a building which contains a flue or flues for conveying smoke or the like to the outer air, and often encloses also the fireplace, if there is one; specifically, that portion which rises above the roof. (See Chimney Stack; Gathering; Hovelling.) (Cuts, cols. 537, 538, 539.)



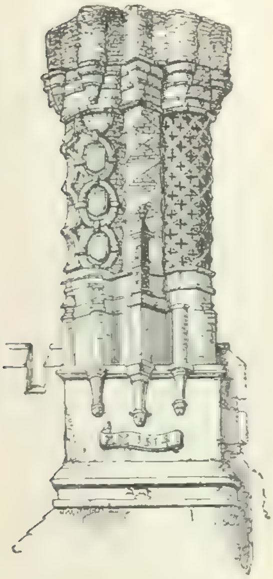
Chimney of a House in Meiningen, Switzerland.

Consisting of a wooden truncated cone over nearly the entire kitchen, and having a movable cover operated from below.

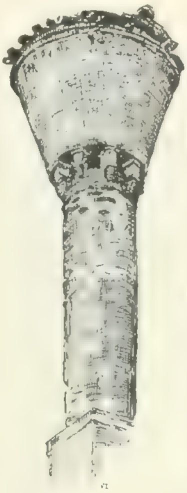
Steam Chimney. A chimney provided to carry off the exhaust steam from a steam plant.

Stick Chimney. An outside chimney built of sticks of wood, generally about one inch thick, by three or four inches wide, laid in the form of a square upon each other with the ends crossing, and plastered with mud, or with lime-and-sand mortar. Used on log cabins and similar constructions in various parts of the United States.

CHIMNEY ARCH. The arch over the opening of a fireplace, supporting the breast. It is usually a flat or segmental arch, though in modern buildings there is much greater variety in form than used to be customary. (See Chimney piece; Fireplace; Mantelpiece.)



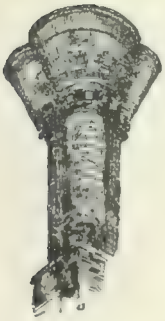
Chimney: Thornbury Castle, Gloucestershire, c. 1514 A.D.



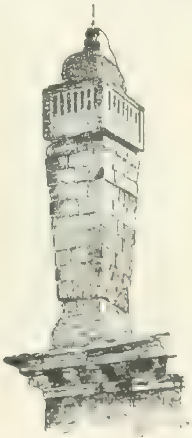
Chimney in Rio di Castel Forte, Venice.

CHIMNEY BACK. *A.* The back or outer wall of a chimney stack, as opposed to the front, in which are the fireplace openings.

B. More commonly the back of the fireplace, against which the fire is built. In the Middle Ages it was faced with brick or tiles; in the seventeenth and eighteenth centuries often a movable back of cast iron, sometimes of very decorative pattern, was used. Fire brick and iron are both used in modern fireplaces. (See Fireplace.)



Chimney of Palazzo Albrizzi, Venice.

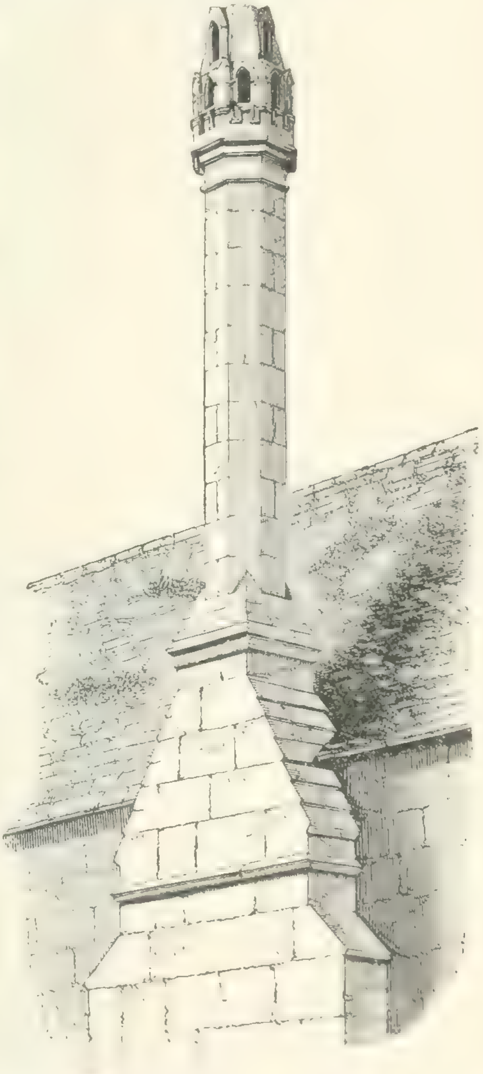


Chimney of Palazzo della Zecca, Venice.

CHIMNEY BAR. A bar or beam for the support or steadying of the masonry above a fireplace. It is either straight or curved, according to the form of the chimney arch, and is usually set a few inches back from the face of the arch, so as to be nearly out of sight.

CHIMNEY BOARD. Same as Fire Board.

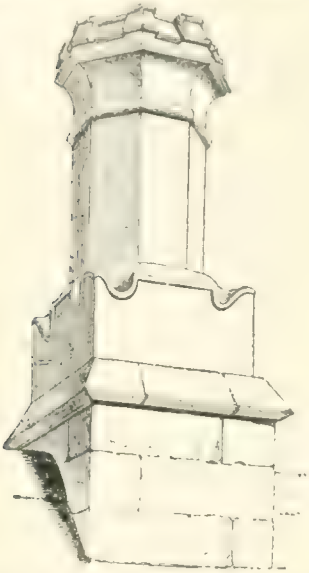
CHIMNEY BREAST. The front portion of a chimney stack, projecting into the building from the general plane of the wall.



Chimney from Archbishop's Palace, Southwell, Nottinghamshire.

CHIMNEY CORNER. *A.* In old fireplaces of exceptional size, the angle or recess formed by the deep jambs supporting the hood or mantle, and provided with seats, the fire blazing between them against the chimney back, while the hood or mantle collected and conveyed the smoke into the flue.

B. In modern houses, a corner or recess built with seats one on each side of an open fireplace. There is often an outer arch, hood, or mantel, covering and including these and seeming to frame the opening of the fireplace.



Chimney at Exton, Rutland, England, c. 1350.

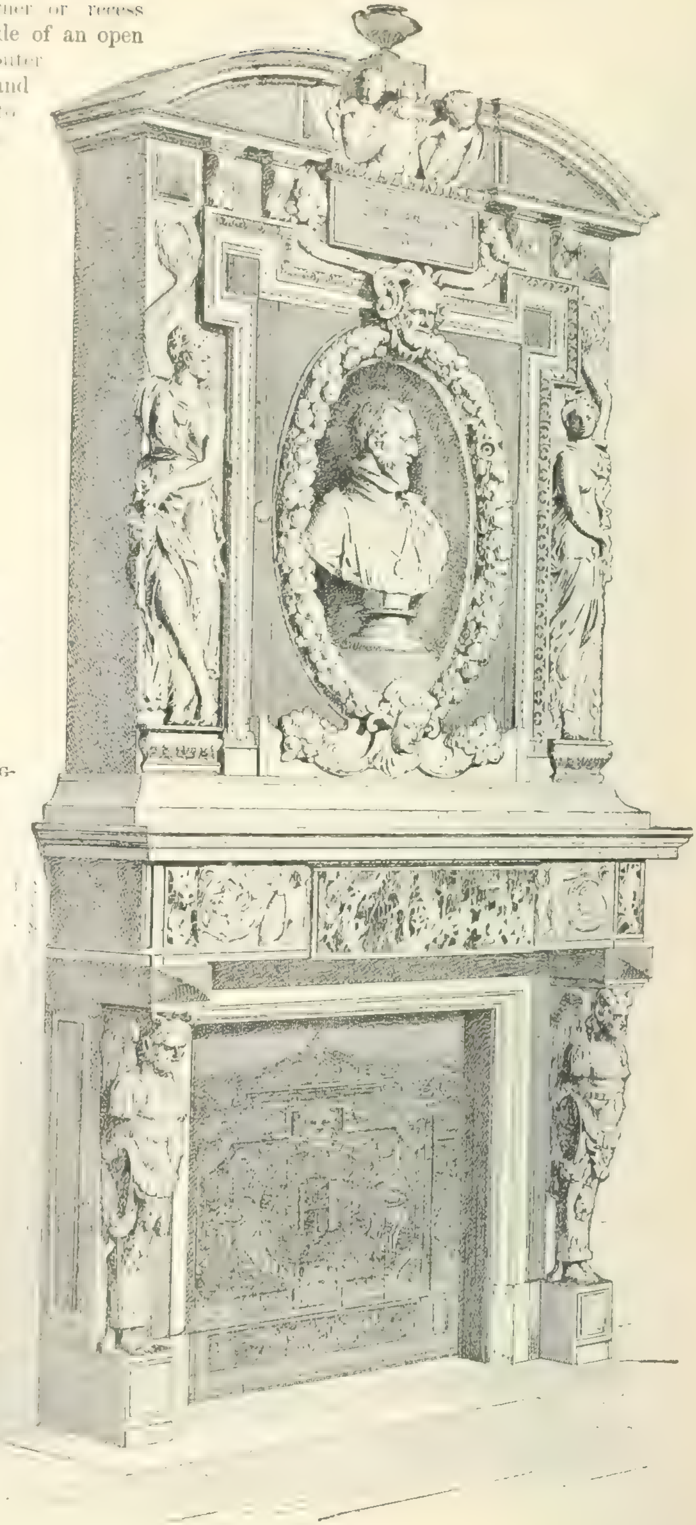
CHIMNEY HOOD. A hood-like structure projecting from a chimney breast out over a fireplace to collect the smoke. Very frequent in the Middle Ages, and of great size. They are less important in Renaissance examples and are seldom seen to-day except as imitations or decorative survivals.

The Persians and Turks employed richly decorated plaster hoods over their niche-like fireplaces.

CHIMNEY HOPPER. A cast-iron frame, like an inverted hopper, built into a chimney over the fireplace to form or support the gathering in of the brickwork at the throat. It is an English device, rarely or never used in the United States.

CHIMNEY MANTEL; MANTLE. (See Mantel.)

CHIMNEY PIECE. The protective structure around a fireplace, often ornamental. (Compare Mantel; Mantelpiece.)



Chimney Piece of the Château of Villeroi; now in the Louvre.

CHIMNEY POCKET. *A.* The vacant space left for economy in the construction of a chimney to bring out a chimney breast to the desired width, or to the desired angle, as for a corner fireplace.

B. The prolongation of a flue below a lateral opening, — as for a stovepipe, — used to catch mortar or soot falling from above.

CHIMNEY POT. A continuation of a chimney flue above the chimney top, so formed and contrived as to increase the draught. Chimney pots were formerly of pottery (whence the name). They are now often made of sheet iron capped by a hood or revolving cowl.

CHIMNEY SHAFT. *A.* That portion of a chimney which rises above the roof. In English and French domestic architecture, especially in the sixteenth and seventeenth centuries, much attention was bestowed upon the design and decoration of the numerous chimney shafts required in important houses, and they were often of great elegance.

B. That portion of a tall chimney — as of a factory — between the base or pedestal and the topping out.

CHIMNEY STACK; STALK. (The second form rare in United States.)

A. The entire structure of a chimney of several flues, comprising the breast, withes, back, flues, stack, and top.

B. A tall isolated chimney for a furnace or factory, having usually but one flue.

C. A chimney shaft in sense *A*; especially when there are several flues and the whole structure is massive and high.

CHIMNEY THROAT. The narrowest portion of a chimney flue, between the *gathering* or upward contraction above the fireplace and the flue proper, which is made of its full section above the throat. The shelf formed by the gathering or drawing in below the throat and the narrowness of the latter are efficacious in preventing down draughts. The throat is often provided with a flap or damper, the closing of which, when the fire is out, wholly excludes both draughts and rain. The proper contraction of the throat was first insisted upon by Count Rumford about the close of the 17th century.

— A. D. F. H.

CHIMNEY VALVE. A valve or damper arranged in an opening in a chimney by which a room may be ventilated. It is designed to allow the air to pass outward while preventing a back draft into the room.

CHIMNEY WAIST. Same as Chimney Throat. (Written also chimney waste.)

CHIMNEY WING. One of the sides or lateral cheeks of the gathering in of a chimney immediately above a fireplace, by which the jambs are contracted toward the throat.

CHINA, ARCHITECTURE OF. Most ancient of nations, centre of Asiatic civilization at different epochs, original source of Japanese culture, architecturally China yet remains, for the European scholar, a barren, or at least an unworked, field. Three thousand years of civil wars, dynastic fighting, and Tartar and Mongol invasion have swept away all trace of palace or temple; the alleged conservatism has not shown itself in architecture, and the existing structures are far less like those of a thousand years ago than are those of the Japan of fifty years since. Indeed, it is from the architecture of this latter country that we must infer what we can of that other that made it possible. Fortunately in the Horiuji temples near Nara (see Japan) we have structures of the sixth century that we know were built by Korean architects, and we also know that at this period the art of Korea was the art of China. There can be no doubt that in these Horiuji temples we have the perfect style of the Buddhist architecture of China, differing from it only to that degree which would appear between the first small temples of missionaries in a savage land and the prototype established among a rich and prosperous people already civilized for a thousand years.

The European student is met at this early period in his study by the insuperable difficulty of deciding how important a part of the architecture of China was formed by those wood-framed temples. In the simple and uniform artistic culture of Japan they formed the more important structures and received the full wealth of that decorative treatment which at all periods the Japanese have known how to give to their industrial art; but in China, a land many times larger, and with a population not only ten times as great but also diverse in origin, distributed into widely separated provinces, between which there was but little intercourse, and giving through long spaces of time but a nominal allegiance to any central government, the architecture of China through the important epochs of artistic history must have been widely different from anything of which travellers and residents in the East have been able as yet to discover and record. Archæological research has never existed for China, nor have travellers at once familiar with building and the decoration of building, and also bold, enterprising, observing, and gifted with leisure and opportunity, ever, as it would seem, made China their place of sojourn and research. The photographs occasionally brought home by tourists, now that the inland provinces may be more freely resorted to than of old, give the lie to very many of the assertions of the standard authorities. A view [illegible] extremely picturesque groups of roof and wall in monasteries and villages near at hand. These buildings which seem the most [illegible] ten antiquity; and the newest buildings, which have been erected under purely Oriental influence, without the interference of Western ideas, have, in their combinations of elaborately worked stone walling, sculptured doorways, decorated windows, and fantastic battlements, with simple thatched roofs, a singular attraction for the student of architecture in its many forms.

In the sixth century the Zen mission brought from China to Japan the architecture of a period later than that of the Horiuji temples, but Obaku-san differs less from Horiuji than do the existing Chinese structures from the former, and it is therefore evident that the swift fall of Chinese civilization in the last two centuries had clearly shown itself in its architecture, which cannot be taken to represent in the least what must have been in the time of the nation's glory.

In the historical records we read of wonderful palaces of enormous extent built during the Ts'ing and Han dynasties before the Christian era, but of the character of their architecture no hint is given. They are spoken of with wonder, but if we were to judge by the more recent palaces of China, Korea, and Japan, they were probably more notable for their extent than for grandeur or beauty. These modern palaces, however, are not the structures by which the ancient traditions should be interpreted. Small, inland monasteries are known and can be partly studied in photographs, and these humbler groups of buildings are far more suggestive of a great architectural past than the more pretentious structures in the cities. Like the modern palaces, the ancient ones undoubtedly consisted of many small buildings crowded together. Very probably masonry entered largely into their construction, for we know that a thousand years before the Christian era brick was the common building material, while even in recent times stone is used far more than is the case in Japan. There are legends of marble steps, terraces, and walls, even of whole buildings, built of marble with roofs of marble tiles. In records of two thousand years ago we read of the burning of royal cities forty miles in circumference, yet we are also told that the kings returned and repaired their burned palaces so they were fit for habitation; this would of course be impossible had wood been the building material, as it is in Japan. Moreover, the "Taa," or pagodas, now existing are generally built of brick covered with porcelain tiles and sheathing, while the "Great Wall," the stone base or terrace of the "Winter Palace," and certain details of proportion and construction in modern wooden structures point unerringly to a former wide use of masonry construction. Further than this we cannot go; of the nature of the architecture from the founding of the Hia dynasty, B.C. 2205, down to the departure of the missionaries for Korea and Japan in the sixth century A.D., we know absolutely nothing.

For the Buddhist architecture of this latter century we must refer to the temples of Horiuji; but whether this was a style peculiar to this religion alone, made up of details taken from Greek, Persian, and Indian architecture and fused by the dominating quality of China herself, or whether by this time, after five centuries of identity with Chinese civilization, it had become the universal architecture of the nation, no one can say. That Buddhist architecture was originally an exotic, brought from India by the first missionaries A.D. 65, is quite certain, for it shows traces of Indian influence that are unmistakable, while the sculpture that came at this time, and in the sixth century was carried to Japan through Korea, is purely Indian, with all its Persian and Hellenic qualities.

Until this time the palace and the royal tomb were the only structures of importance recorded; but after the advent of Buddhism, when this exalted religious system took the place of empty Confucianism and the superstition of Taoism, the true temple became of almost equal importance with the palace, and of even greater value architecturally. The plan, component parts, structure, and design of the typical Buddhist temple and monastery are described under Japan, and need not be repeated here.

The architecture of the imperial city of Pekin, and of the seaport towns, which is that best known to the European student, is nearly all of a very recent epoch. And it is to be noted that the comparative slowness of change in the East does not in any way guarantee the retention in the modern buildings of such charm as the ancient ones possessed. All the records of art history show the rapid degeneration of grace, harmony, charm of proportion, and elegance of detail during the periods of copying, nor can any conservatism be so great as to insure the retention of the better characteristics of an ancient art. Just as there is in China an apparent disappearance of the great ancient arts of painting, ceramic decoration, wood carving, and the like, so the buildings of modern times are the work of a decadent people, who willingly abandon all attempts at pure decoration, but who must still create buildings for practical uses. All that remains of architectural excellence in these modern buildings is the dignity of great masses, and the contrast, often very agreeable, between light, generally wood-built, superstructures, with the massive walls of the basements. Thus, the "Winter Palace" at Pekin, and the great gateway structures of the same city, with three- or four-story buildings raised high upon a defensible substructure of massive stone, deserve admiration for the dignified treatment of their large and varied groups; and some of the pagoda towers, which are often unfavourably criticised because of the monotony of their succession of equal stories, are impressive because of that very monotony. In general, however, it is safe to conclude that the Chinese architecture of the last 300 years is immeasurably inferior to that which must have gone before.

In Japan, while there was a great falling off in the purity and nobility of the style after the time of the Ashikaga Shoguns, there was not a complete loss of architectural identity, and the increase in gorgeousness of ornament and richness of decoration give the Tokugawa style a distinct quality of its own. In China, on the other hand, all that we can now see is the record of a complete collapse of civilization. The curves of the temple roofs are gross and exaggerated, the pagodas, usually octagonal in plan and often nine stories in height, are often clumsy, while the colour tends to be crude and violent.

It is easy to see why this decadence should have taken place in China and not in Japan, for the latter country has never been conquered since history began. Its dynasty has endured for thousands of years, and it possessed during its twelve centuries of greatness a dominant and united religion, and a complete system of social organization. In China the case has been wholly different. Now united under one ruler, now divided into fighting states, it has seen a score of dynasties, and twice — once in the thirteenth century by Kublai Khan, the Mongol chief, and once in the sixteenth century by the Manchus, under Li — it has been entirely conquered, and it still remains under the dominion of the Manchu invaders.

Mongol and Manchu influences are everywhere visible in what passes for modern architecture, and this fatal barbarism makes Chinese architecture unworthy the study that the art of building in Japan can justly claim.

That at one time Chinese architecture was a thing of the utmost beauty and grandeur we cannot doubt. Hangchow, the capital of the Sung dynasty in the thirteenth century, is said to have been one of the most wonderful cities of the world, and we know that the lofty civilization created by the wise emperors of this most famous line could only have expressed itself in noble art. But Hangchow is only a name, and the Mongol invasion swept away all traces of the Sung régime. The Ming dynasty tried in vain to restore the old art, but, gorgeous as were the results, they were without the purity of the older style. The famous "Summer Palace" and "Winter Palace" showed through the overloaded splendour of their colour and ornament the hard lines, the coarse curves, the clumsy masses, that inevitably mark a degraded style. The buildings of the Ming dynasty were yet not without grandeur from their very size. The "Winter Palace," raised on its huge stone terrace, and recalling the Doric temple of Assos in its design, was vast and impressive; while the royal tombs were huge structures that must have possessed great dignity, since we read of vast halls 210 feet by 90 feet and 64 feet high with their roofs supported by teak columns 4 feet in diameter and 32 feet high; marble terraces, enormous flights of steps, huge stone gateways, and wonderful gardens made up compositions of amazing richness, while the painting and sculpture and porcelain of this period filled the interiors with a wealth of splendid decoration; but the Temple of Heaven, in Pekin, built in 1420, and the porcelain tower at Nankin showed very clearly the trail of barbarism in all their lines and proportions.

The buildings that exist, or were destroyed only in recent times, are temples, palaces, "taa" or pagodas, and "pailoo" or memorial gates. The temples are similar in plan to those of Japan, consisting in the case of Buddhism of a great enclosing cloister and in the midst a hall of statues, a preaching hall, a pagoda, a library, and various smaller structures, together with quarters for the abbot and the priests. Horuiji at Nara and Obaku-san near Uji, both in Japan, are the best types existing. The "Summer Palace" consisted of many detached pavilions scattered over an enormous area, pavilions bearing a distant resemblance to the Ho-o-do at Uji and the Kinkaku-ji at Kyoto, but coarse and overloaded in detail. The "Winter Palace" forms three sides of a square with a high first story of unbroken stone walls crowned by a forest of columns supporting low curved roofs, with small pavilions at the salient angles. This structure has more dignity of proportion and strength of design than any others now existing. The pagodas were generally octagonal, occasionally hexagonal, in plan, and were sometimes nine stories in height. They varied greatly in design, the stories being sometimes very high, the roofs small and narrow, sometimes with curves grossly exaggerated. Built of brick, they were cased in decorative pottery commonly said to be porcelain, with marble galleries and balustrades of gilded iron; the roofs were often covered with glazed yellow tiles. In no case has any existing pagoda anything of the classical refinement, the indescribable grace, of those of Japan. The monumental gateways have no copies in Japan. They possess a curious resemblance in some ways to the ancient Roman memorial arches, though the openings are covered by lintels; there were usually three of these, the supports being richly carved piers of stone, supporting narrow roofs of tile.

The domestic architecture of China possesses little resemblance to that of Japan. The houses are often several stories in height, and are commonly built of masonry, with doors and windows to [illegible] like those of Europe, in spite of their differing and often fantastic forms of decoration, than are the entrances or the light openings of similar buildings in Japan. The larger and more richly decorated of the now existing dwellings are interesting, because of the completely different ordering of the architectural members from that which is familiar to Europeans. As in Japan, so in China, the column does not necessarily have a capital or any spreading and architectural base; the trabeation does not of necessity form anything resembling an entablature; and an arch of masonry does not always take a form in any way corresponding to forms of European arcuated buildings. Grecian influence is perhaps to be found in China, coming overland, with the other results of Indian origin and derived culture, from the southern peninsula; but of Roman tradition there is perhaps none to be found. Thus a rich and ornamental gateway is commonly built without arches or anything in any way resembling arches, and is apt to consist of an elaborate system of post and beam construction like the well-known Torii, in general scheme, but immensely more numerous in its parts and more elaborate in design. The interiors of dwellings are apt to be divided by carved open-work tracery and screens, sometimes merely quaint and of curious angular design in fretwork; but sometimes, also, of elaborate carving adorned with painting and lacquer, and by ingeniously perfect inlays of rich silk and other fabrics. It is impossible to say how far the finer screens and other details of interior decoration are ancient, and how far such are still made in some of the inland provinces.

In the Chino-Japanese architecture of Japan we find a style that has existed and developed logically for twelve hundred years, and is entitled to rank with the great styles of the world; in such architecture as remains in China we find only a decadent and erratic episode. (See Pai Loo, Paoh Tah.)—R. A. Cram.

Gratton, *Notes upon the Architecture of China* in *R. I. B. A. Journal*, 1894–95.

CHINKING. *A.* Material used for filling a hole or crack in a wall, especially in log cabins. Usually chips or sticks of wood.

B. The process or operation of filling up small openings, or chinks, especially the interstices between the timbers of a log building, with chips, moss, clay, and the like. This operation is commonly followed by daubing, the entire process being known as chinking and daubing.

CHIPOLIN PAINTING. The imitation in painting of cipolino marble; hence, of any marble of light gray or greenish veins.

CHIPPENDALE, THOMAS; cabinet maker and carver.

Chippendale was a native of Worcestershire (England). In 1752 he described himself as a cabinet maker and upholsterer in S. Martin's Lane (London). In 1752 he published the first edition of a book of his own designs entitled *Gentleman and Cabinet-maker's Director.* A second edition was published in 1759, and a third in 1762.

Heaton, *Furniture and Decoration in England*; Sheraton, *Cabinet Maker and Upholsterer's Drawing Book*; Redgrave, *Dictionary of Artists.*

CHODEGRAND. (See Chrodegand.)

CHOIR. *A.* Primarily, that part of a church in which the singers were accommodated. In Catholic churches, where there were many persons employed to sing the Mass and other services of the Church, the space allowed for these singers and the clergy became very large; hence arose the signification *B*, which, however, is to be understood as inaccurate, and a loose term for that which has no accurate one. (See Chancel.)

B. In a church, that part of the main structure which is in great part occupied by the choir proper, *A*, above. This, in a cruciform church, will be that arm of the cross which is farthest from the main entrance; that is to say, at the east end of the church when oriented in the usual manner.

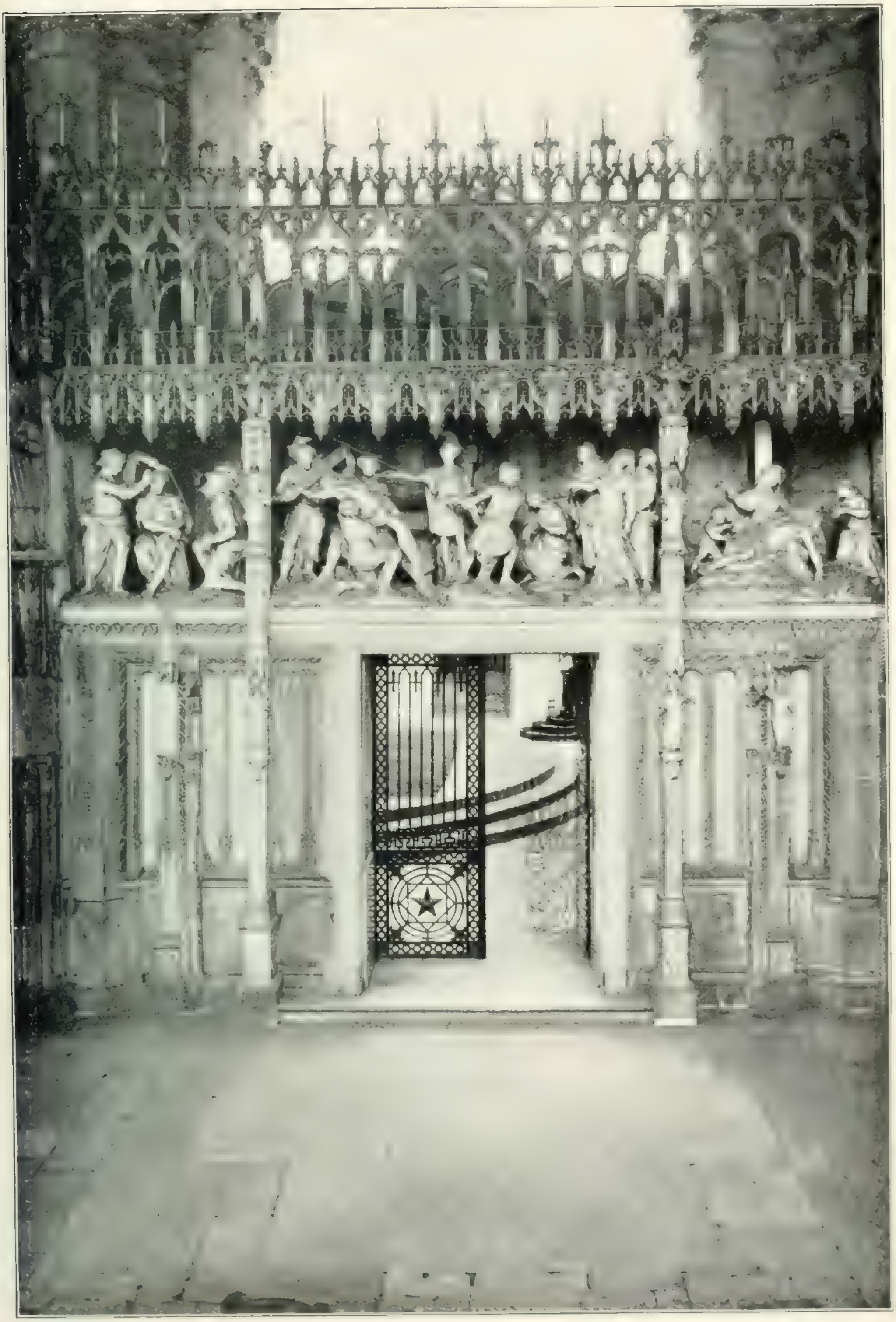
Thus, in a large church, the term choir has two very different meanings: 1st, the actual enclosure in which the clergy and choristers perform their duty; and 2d, one great arm or extension of the building including the rounded apse, if there is one, and the deambulatory surrounding that apse, if there is one. The choir, being considered the most sacred part of the church, was often built in advance of the rest of the structure, and on this account many of the large churches of Europe have a choir of different date from the other parts.

The floor of the choir is often raised higher than that of the nave. Where there is a crypt, this may occupy the whole space below the choir, the floor of which will then be much elevated; thus, at S. Zeno in Verona, the number of steps up to the choir floor and down to the crypt are about equal; and in S. Miniato al Monte, near Florence, the disposition is about the same, with sixteen rather steep steps leading up to the choir floor. In England, a similar arrangement exists in the cathedrals of Rochester and Canterbury.—R. S.

CHOIR AISLE. The aisle on either side of the choir in a large church. When the aisle is carried around the apse of the choir, as in many French and some English and German churches, it becomes the deambulatory. (See Ambulatory; Apse; Cathedral; Chevet; Church.)

CHOIR ENCLOSURE. Same as Choir Screen.

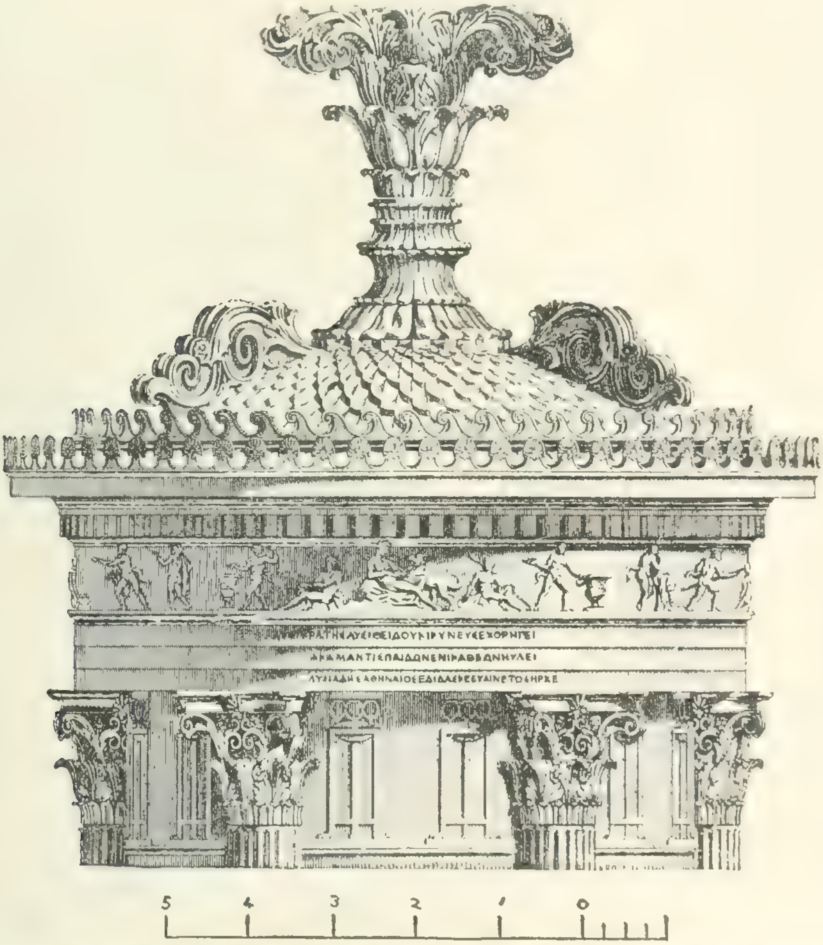
CHOIR SCREEN. A wall, railing, or partition of any sort, and of any material, dividing the choir, in sense *A*, from the rest of the church, and perhaps enclosing the sanctuary as



CHOIR SCREEN

That of the cathedral at Chartres (Eure-et-Loir). It encloses the choir on the north and south, and is carried around the chevet. It was begun about 1515, and the general director of the work was the same man who built the beautiful north tower of the cathedral—Jean de Beauce, who died in 1529. The sculptured groups are by many different masters.

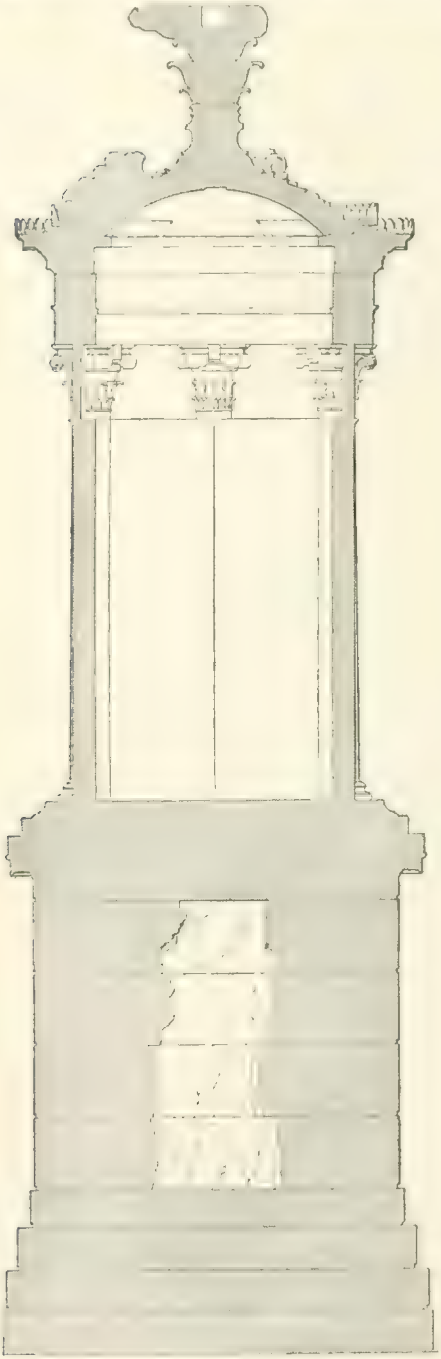
well as the choir. Walls surrounding a retrochoir or two separate choirs would be properly called by the same name. In practice, the term is often restricted to that part of the enclosure which separates the choir from the aisles and the deambulatory which encloses it; that is to say, to the series of screens between the great pillars which carry the clerestory walls in a large church. In this sense, the choir screen cannot exist in a church which has no aisles on either side of the choir. From this sense, too, the screen work, or wall, which divides the nave or crossing of the church from the choir proper is excluded, and the term rood screen, or jubé, is reserved for that part. In the writings of the latest ecclesiologists, however, the term choir screen is used for the barrier, often modern and of elaborate wrought-iron work, closing the western end of the choir; that is, for the jubé. The magnificent screen in the cathedral of Chartres is of the sixteenth century, but this encloses only the sides and the rounded eastern end; while the western end, where the choir is more commonly separated with peculiar care from the nave, had a superb jubé of the thirteenth century which was destroyed about 1760, and has never been replaced by any worthy enclosure of any kind. At Amiens, there are walls built in between the great piers which carry the clerestory walls, and upon and against these walls and facing outward are splendid architectural canopies protecting late Gothic painted sculpture of the utmost importance and variety. The other side of this screen is, then, blank, and entirely concealed by the superb woodwork of the stalls. The most perfect Gothic choir screen in France is that of the cathedral of Albi. (See Altar Rail; Altar Screen; Chancel Screen; Haikal Screen; Iconostasis; Jubé; Rood Screen; Sanctuary Screen.) — R. S.



Choragic Monument of Lysicrates, Athens; Restoration by Stuart and Revett. (See Cut, Col. 551.)

CHOIR STALL. (See Stall.)

CHORAGIC MONUMENT. A votive or commemorative structure erected by the successful choragus (*χορηγός* and *χοραγός*) or leader of a chorus in the competitive choral dances of the ancient Greeks. The prize, a tripod, was displayed upon the monument, which was of small size and decorative character. The most famous example is the circular Corinthian ædicula erected by the choragus Lysicrates in Athens about 330 B.C., still extant in a ruined condition; it was surmounted by a highly ornate three-branched finial, on which was placed the tripod won in the contest. The Corinthian order here used is one of the few early examples in Greek architecture. (See Corinthian Order.) The choragic monument of Thrasyllos is also standing in part, on the slope of the Acropolis above the Dionysiac Theatre at Athens. The "Street of Tripods," in ancient Athens, was lined with these elegant trophies of artistic victory. — A. D. F. H.



Choragic Monument of Lysicrates, Athens, Greece. (See Cut, Cols. 549, 550.)

CHORAGIUM. In the ancient Greek civilization an open space for choral dances or for competitive choral performances. (Spelled also choragion.)

CHORD. *A.* In geometry, the straight line drawn between the extremities of an arc.

B. One of the two principal members extending along the top and bottom of a truss. (See Truss.)

CHOULTRY. An open, shedlike structure of stone or wood built for the use of travellers, for shelter, refreshment, or rest. Some of these are of great splendour. The name, which is of Anglo-Indian origin, has also been applied to great *mantapas* or *chaories* of the Dravidean temples, like the hypostyle hall of Tirumalla Nayak at Madura, but this is an incorrect use of the term. (Written also *Choultrie* and *Chultrie*.)

CHRISMANN (GRIESMANN, KRISMANN), FRANZ XAVIER; priest and organ builder.

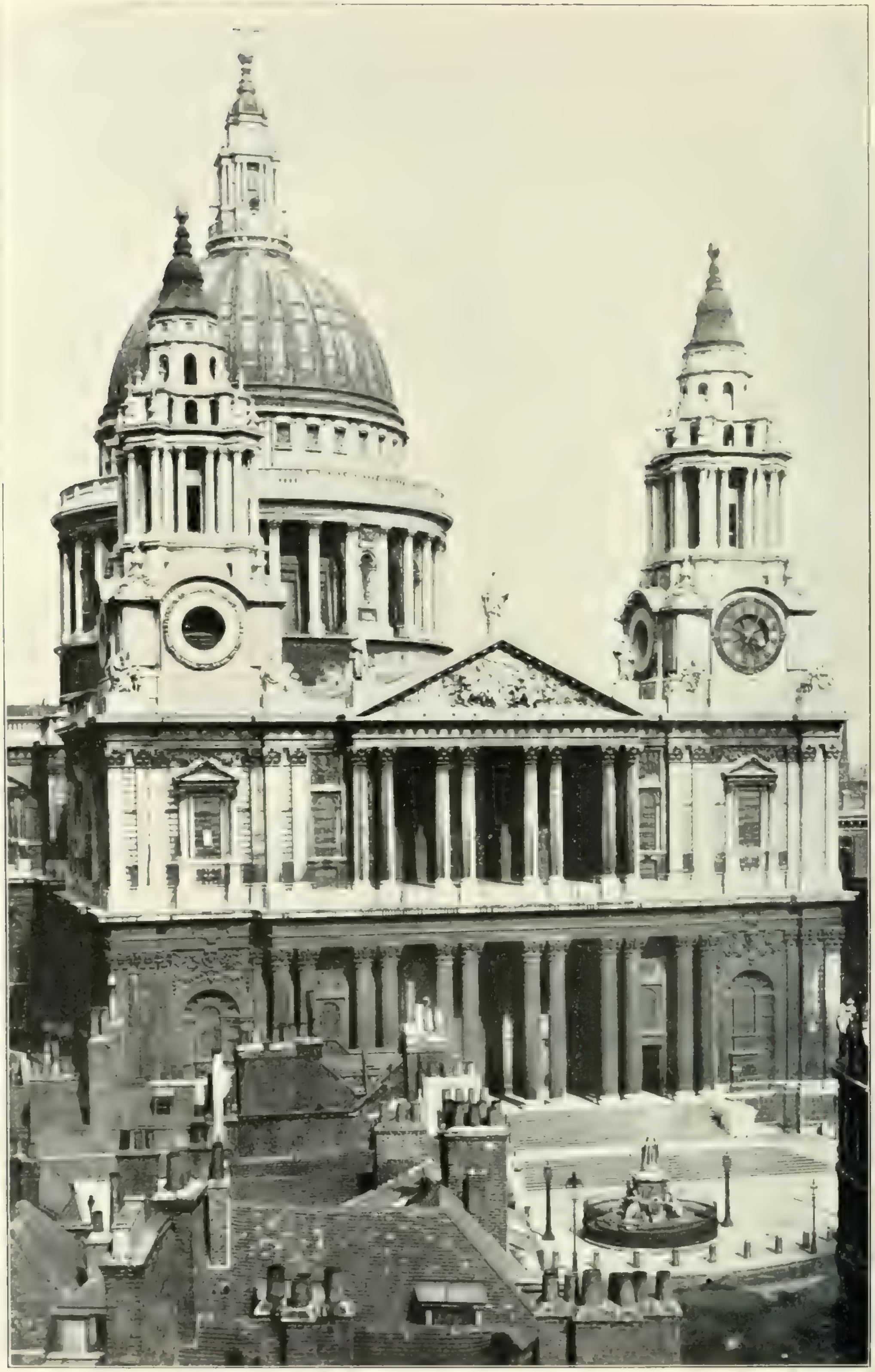
Chrismann was a priest from the diocese of Laibach (Austria), and one of the foremost organ builders of the eighteenth century. In 1770 he began the great organ of St. Florian, near Lintz (Austria). That of the Schottenfelder church, one of the finest in Vienna, was finished in 1790.

Allgemeine deutsche Biographie.

CHRISMATORY. A movable receptacle to contain the bottles of oil, usually three, for various sacred purposes; hence, a recess or ambry, usually near the font, to contain the oil for anointing after the baptism.

CHRISTIAN ARCHITECTURE. *A.* That of any style assumed to be especially under the influence of Christian religious belief. In this sense the English Gothic and the other mediæval styles were called Christian by the Gothic revivalists of 1850 and thereafter, as a term of approval intended to excite the admiration and enthusiasm of students, much as the English Gothic was called at the same time an English national architecture. The styles which came of direct imitation of Greco-Roman architecture were considered pagan in contradistinction to this of the Middle Ages.

B. More properly that of the European world since the general triumph of Christianity.



CHURCH

That of S. Paul, the cathedral of the city of London. The west front shown in the picture is one of the finest parts of the church, the upper and lower portico harmonizing singularly well with the flanking towers. The small round-headed windows on either side of the upper arcade open into the clear space left between the actual clearstory and the masking wall of the north and south flanks — the worst blot upon the design of the cathedral. The great cupola has the lower or inner drum and its peristyle and the upper drum and the lantern all of stone, the lantern resting upon a cone of brick; but the curved surface is of lead upon a wooden structure. The building was designed by Sir Christopher Wren, begun in 1665, and entirely completed in about thirty years.

In this sense the earliest Christian architecture is that of the basilicas and baptisteries of the reign of Constantine (see Latin Architecture); and all buildings erected since that time in lands occupied or settled by Europeans are Christian, except where obviously the work of persons of other religions. In this sense, however, military and domestic architecture are included, thus contradicting the meaning in sense *A*. (See Baptistery; Basilica; Byzantine; Church; Gothic; Romanesque; also, Chapel; Choir; and the terms applied to minor details of religious edifices.) — R. S.

CHRODEGAND, SAINT; bishop and architect.

In 757 Chrodegand, Bishop of Metz, reëstablished the *monasteria clericorum*, or communities of clergymen in the service of the cathedral churches. The cloister which he built about his cathedral at Metz, Lothringen, Germany, was the pattern from which buildings of this class were afterward constructed. This cloister, which probably retained many of its original features, was destroyed in 1754 by the Maréchal de Belle-Isle. Chrodegand rebuilt the cathedral of Metz and designed the abbey of Gorze.

Lenoir, *Architecture Monastique*; Coëtlosquet, *Cathédrale de Metz*; Gérard, *Les Artistes de l'Alsace*.

CHRYSELEPHANTINE. Composed of gold and ivory; a term applied by the Greeks to certain statues of exceptional importance, in which the draperies were of gold and the nude portions of the figure of ivory, built up most probably upon a wooden framework. The most celebrated were those by Pheidias of Athena in the Parthenon at Athens, and of Zeus seated in the temple at Olympia. Constant care was needed to prevent the swelling and cracking of the ivory by changes of temperature and humidity. — A. D. F. H.

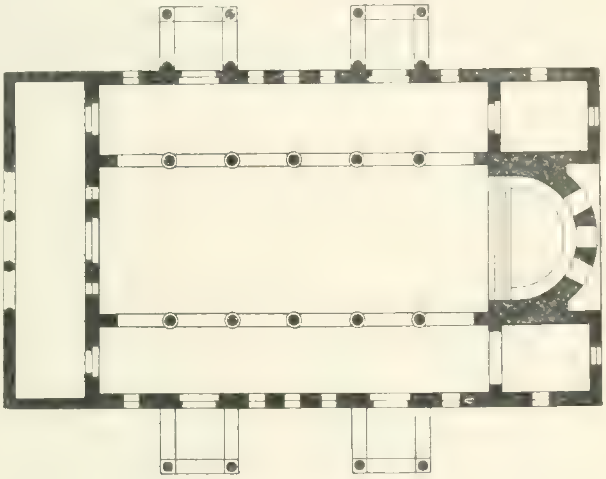
CHULTUNE. A subterranean chamber of irregular shape as built by the ancient Mayas, often in the cavity left by the extraction of zaccab (which see) from the pockets in which it occurs. Usually single and from ten to fifteen feet below the surface, with a well-like opening at the top covered by a slab. The walls, roof, and floor were sometimes of dressed stone finished with a coat of stucco. Supposed to have been reservoirs, but also used as sepulchres.

For details see *The Chultunes of Labna*, E. H. Thompson, Mem. Peabody Museum, Vol. I., No. 3. — F. S. D.

CHUNAM. A kind of white plaster or stucco much used in India, and variously compounded according to the district where it is made and the purpose for which it is intended. In general, lime and sand in equal parts are mixed with a paste made from sugar and the juice or jelly of vegetables and fruits boiled and beaten up, sometimes with an admixture of yokes of eggs and chopped hemp. Some varieties of chunam are capable of receiving a high polish.

CHURCH. A house of Christian worship.

In England the term is restricted to the edifices of the Establishment, those of other denominations being called chapels. In France, while a Catholic church is called *église*, a Protestant church is called *temple;* and in Italy, while a Catholic church is called *chiesa*, a Protestant place of worship is called *tempio.*



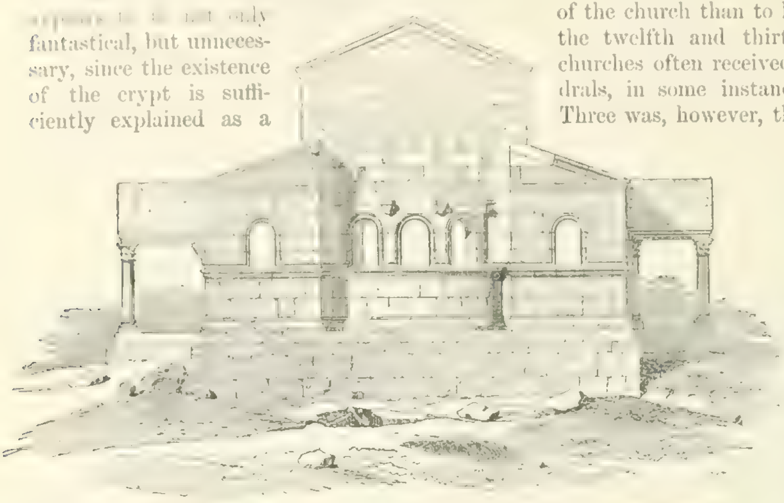
Church at Baqouza, Syria; 6th Century. (See Section and Cut, Cols. 555, 556.)

The plan of the church most frequent throughout western Europe was derived from the Roman basilica, which of all public buildings in existence at the time of the rise of Christianity seemed best adapted to the wants of the new religion. This consisted of a nave, divided by columns (supporting either arcades or an entablature) from the side aisles, which may be either two or four in number and terminating in a hemicircle or apse. In the earliest churches here was the altar, and at the back, against the wall of the apse, in Episcopal churches was the bishop's throne. The priest officiated at the back of the altar facing the people, who occupied the nave, the men on one side, the women on the other. As time went on other forms were grafted upon the original one.

1. The TRANSEPT. This existed in embryo in more than one Roman basilica, but its development was the work of Christian architecture. From S. *Paolo fuori le Mura* (Rome, A.D. 386) the usage continued down to modern times. It has been frequently maintained that the

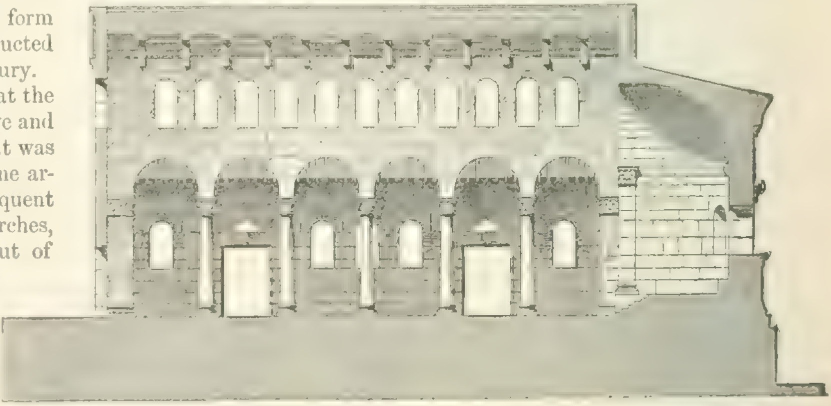
[illegible] the term [illegible] was chosen for its [illegible], [illegible] this there is great doubt.

2. The CRYPT, which many writers think a reminiscence of the catacombs. This derivation appears to us not only fantastical, but unnecessary, since the existence of the crypt is sufficiently explained as a place of burial for saints or great personages, or as a shrine for relics.


Church at Baqouza, Syria; 6th Century. (See Plan and Section.)

3. The NARTHEX, a vestibule extending generally across the west end of the church, to which were admitted catechumens, energumens, penitents, and all who were held not worthy of complete participation in the privilege of worship. Three English cathedrals, at least, had each a Galilee for the same purpose — Durham, Lincoln, and Ely — and many German churches had their *Vorhalle* or *Paradies*. The atrium before S. Ambrogio at Milan and that before the abbey church of Laach may be named in this connection. The narthex and the crypt belong to the earlier Middle Ages. They do not form part of churches constructed after the twelfth century.

4. The CUPOLA at the intersection of the nave and transept. This element was derived from Byzantine architecture; it was frequent in Romanesque churches, especially in Italy, but of great rarity in Gothic ones, though it returned with the Renaissance and became a dominant feature in that style.


Church at Baqouza, Syria; 6th Century. (See Plan and Cut.)

5. The BELL TOWER. Though bells were used as early as the seventh century, they were so small as not to demand a tower to hang them in. Large bells, says Viollet-le-Duc, were not founded before the twelfth

century,[1] and he argues from the fact that magnificent towers were already added to churches at least a hundred years earlier, that they were built rather as tokens of the power or wealth of the church than to house its bells. During the twelfth and thirteenth centuries, parish churches often received two towers, and cathedrals, in some instances, as many as seven. Three was, however, the ordinary number. In Italy the tower was often separate from the church. (See Campanile.)

6. One or two exceptional forms may here be noticed. Two transepts are sometimes found, as in several English cathedrals; at Cluny and in some German churches, which have even eastern and western apses and two crypts (*e.g.* Bamberg). With these may be mentioned double churches; that is, of two stories, each adapted for independent worship, as the Sainte-Chapelle in Paris, S. Francesco at Assisi, and the church at Schwarz Rheindorf. Double chapels attached to castles were common in Germany; the upper story connected with the apartment of the lord of the castle. Between the upper and lower stories there was an opening in the floor, apparently that persons below might hear the service celebrated above. Such an opening existed originally also at Schwarz Rheindorf. With these exceptional forms may be included fortified churches, frequent in the south of France, and in Picardy at the time of the Spanish occupation of the Netherlands.

7. The orientation of churches from west to east can scarcely be called a Christian pecu-

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[1] *Dict. Rais. de l'Arch.*, article *Clocher.*

fiarity of plan, since the same principle obtained in temples built before the Christian era. None the less, for many hundreds of years it was a necessary element of the church plan, and is still so in England and elsewhere, when ritual prescriptions are strictly regarded. In many of the most ancient churches of Rome (*e.g.* S. Pietro in Vaticano, S. Maria Maggiore, S. Giovanni in Laterano, etc.) the apse and altar were (and are) at the west end. The priest then officiated behind the altar, and, therefore, faced the east; but from the eleventh century the constant usage put the altar niche at the east end, and the main façade toward the west. A glance, however, at the map of any European city, rich in mediæval churches, will show that the orientation is seldom exact. Notwithstanding prescriptions that the direction should be taken at the time of one of the equinoxes, it would seem to have been a general practice to take it on the day of beginning foundations, in England, often on the day consecrated to the saint whose name the church was to bear, and on occasion, even at one of the solstices; so that churches face in almost any direction, save north and south. In cities, the necessities of the site often affected the orientation, and, in Italy, the principle was neglected after the fifteenth century. In the Protestant world it has been from the beginning disregarded.

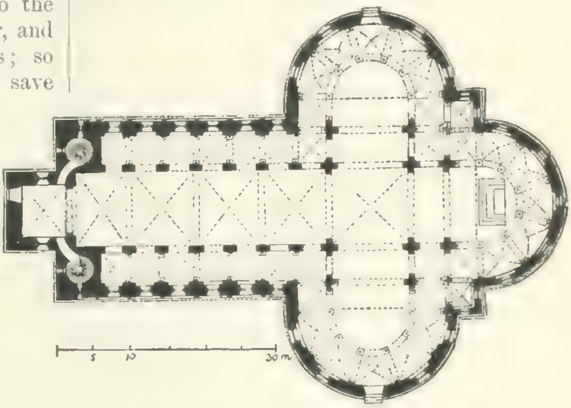
Another type that has influenced church architecture, down to the present time, was the Byzantine, the essential feature of which was a circular cupola sustained by means of pendentives above a square ground plan. It is noteworthy that the greatest example of the style, S. Sophia at Constantinople, furnished the model for the mosques of Turkey, while the churches of Eastern Europe, — Greece, Russia, Armenia, Rumania, etc., — with many in Western lands, receiving the impulses by way of S. Mark's in Venice, — followed another type: a Greek cross, enclosed in a square, with a cupola at the intersection of the arms, and sometimes four subordinate cupolas covering the spaces between the arms and the enclosing square. The number of the subordinate cupolas varied from two to twelve. A third type, represented by S. Vitale at Ravenna, and consisting in plan of two concentric octagons (to indicate roughly the essential feature), has had great influence on succeeding architecture. Many churches of similar plan are supposed to be inspired by the Holy Sepulchre at Jerusalem.

The Renaissance, although adopting almost in its purity the ordinary Greco-Byzantine plan, as well as that of the basilica, also modified these two types profoundly, and introduced new elements, opening the way to all the varieties of modern ecclesiastical architecture.

Churches may be divided according to hierarchal order, as seen in the sub-titles given below, viz., Abbey C., Cathedral C., Collegiate C., Conventual C., Metropolitan C., Parish C., Patriarchal C., Pontifical C., etc.

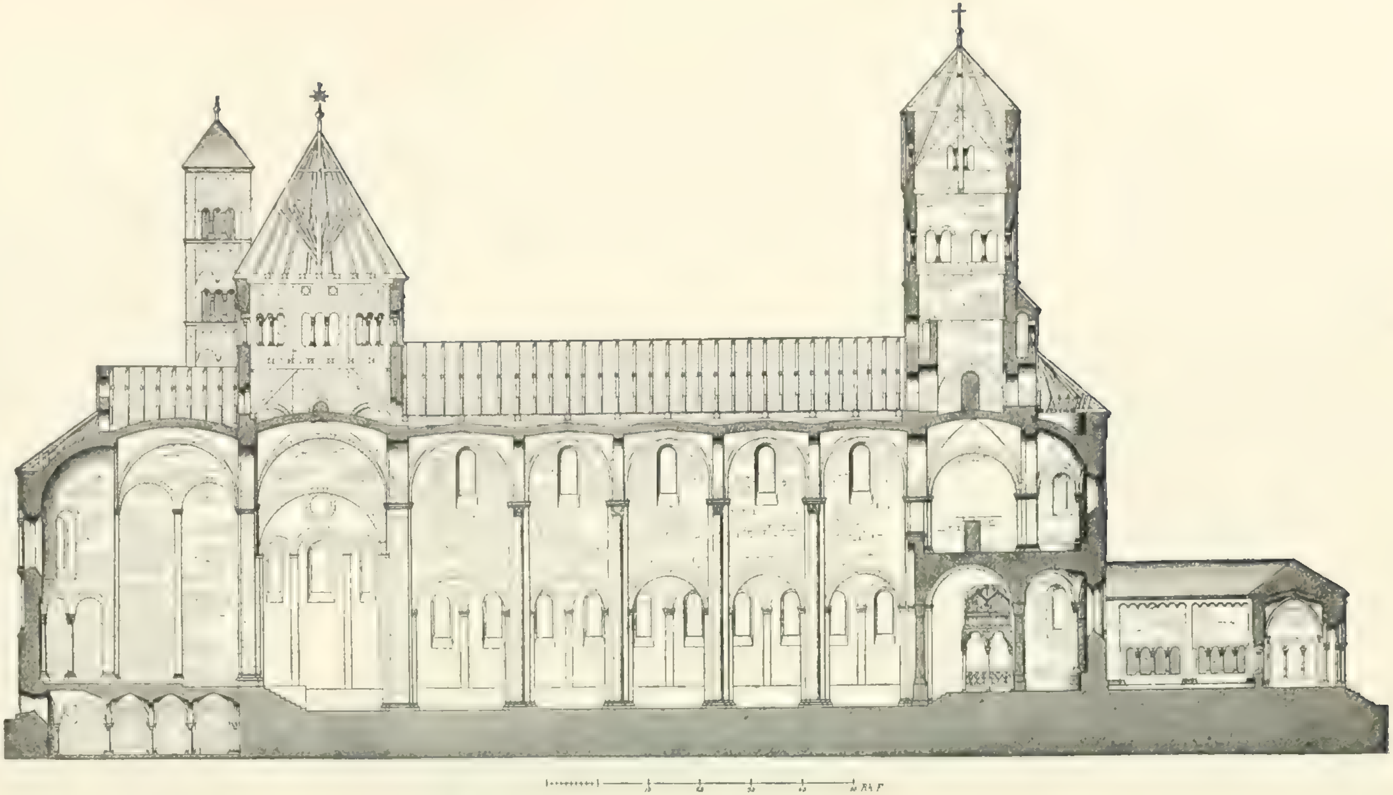
There are also certain names of churches for which no English equivalent exists; thus, in Italy, the *Chiesa Palatina* is the church of the palace, a private chapel of the inhabitants of a palace; and the *Pieve*, which is simply the chief church of a district called the *pievania* or *pieviere*, and is administered by a priest called a *pievano*, who has under his jurisdiction other ecclesiastical establishments.

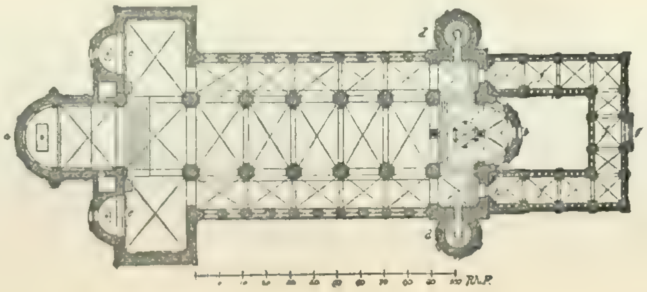
The early Christian, Byzantine, Gothic, and Romanesque styles are almost wholly ecclesiastical, their development being in their churches. Therefore, a book on Gothic architecture, for instance, is mainly an account of Gothic churches. For the churches of the Renaissance, and later styles, there are no books of general history and criticism, but see, for the Renaissance in Italy, Laspeyres, *Kirchen der Renaissance in Mittel-Italien;* Cicognara's great book on Venice; Letarouilly, *Les Édifices de Rome Moderne*, and such other treatises, which give the public buildings of great architectural centres; even the books cited under Brickwork are mainly devoted to churches. See also Hübsch, *Die altchristlichen Kirchen*, etc.; a translation under the title *Monuments de l'Architecture Chrétienne*, published in Paris, 1866. It is a large folio with a vast number of plans, sections, etc., so presented as to be easy of comparison. Dehio and Bezold: *Die Kirchliche Baukunst des Abendlandes*, begun in 1887, is still unfinished. It is largely a compilation, and undertakes to be an almost complete encyclopædia of church building. — J. S. Fiske.



Church of S. Martin, Cologne.

Hübsch, *Altchristlichen Kirchen*; Lübke, *Vorschule zur Geschichte der Kirchenbaukunst des Mittelalters*; Quast, *[illegible] der Kirchenbaukunst des Mittelalters*; Brandon, *Parish Churches*; Baudot, *Églises de Bourgs et Villages*;





ABBEY CHURCH,
LAACH, GERMANY,
12TH CENTURY.
(SEE CUT, COLS. 561, 562.)

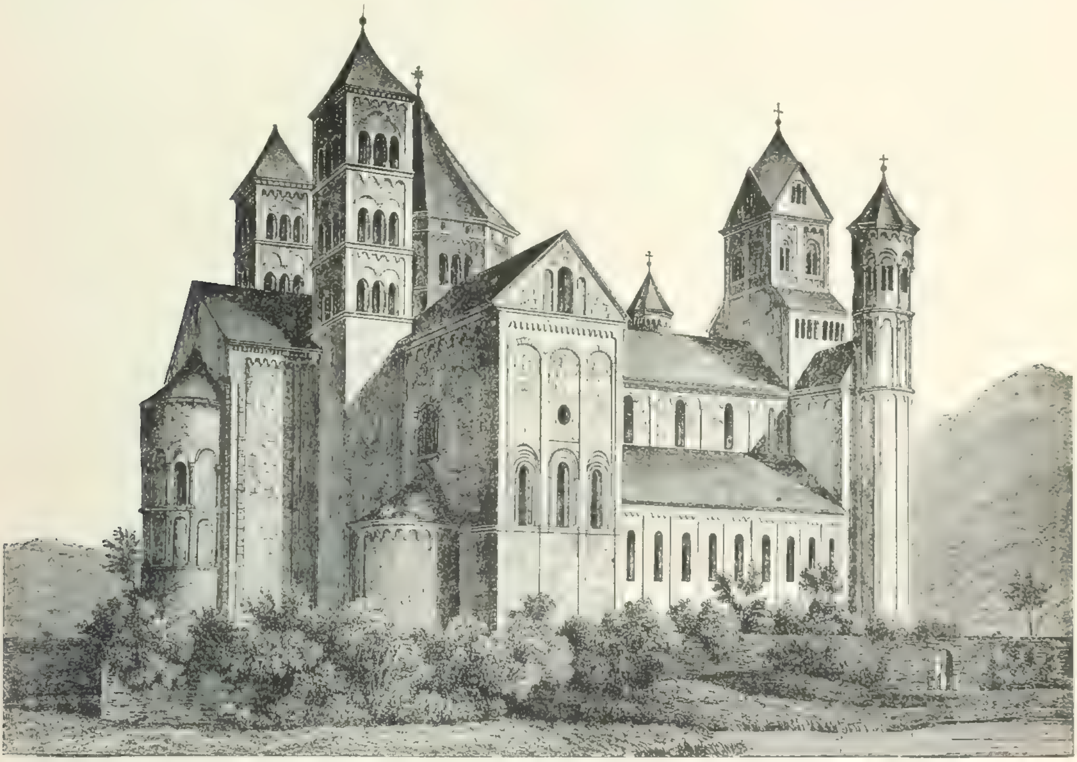
Schäfer. *Mustergiltigen Kirchenbauten des Mittelalters in Deutschland*; Viollet-le-Duc, *De la construction des édifices religieux en France* in *Annales Archéologiques*, Vols. I. to IV.; Clausse, *Les Monuments du Christianisme au moyen-âge.*

Abbey Church. *A.* The church of an Abbey.

B. The church of any conventual establishment; especially applied to such buildings in the British Isles.

Cathedral Church. The principal church of a bishop's see. (See Cathedral, n.)

Collegiate Church. *A.* One administered by a body of canons who form a college.



Abbey Church, Laach. (See Plan and Section, Cols. 559, 560.)

B. One served by two or more clergymen, whether these are attached to a single building, or, as in certain sects, having four or another number of buildings under their common supervision.

Conventual Church. Same as Abbey Church in sense *B.*

Hall Church. A church built in the form called Hallenbau (which see).

Metropolitan Church. The Cathedral Church of an archbishop. York and Canterbury cathedrals are the metropolitan churches of England. The Patriarchal and the Pontifical Church are also metropolitan churches.

Old North Church. In Boston; generally thought to have been Christ Church on Salem street, the oldest building remaining in the city; built in 1723. It has been claimed that the name "Old North" was properly given to the church in North Square, now demolished.

Old South Church. In Boston, on Washington Street; built in 1729. The name was given to distinguish it from the North Church.

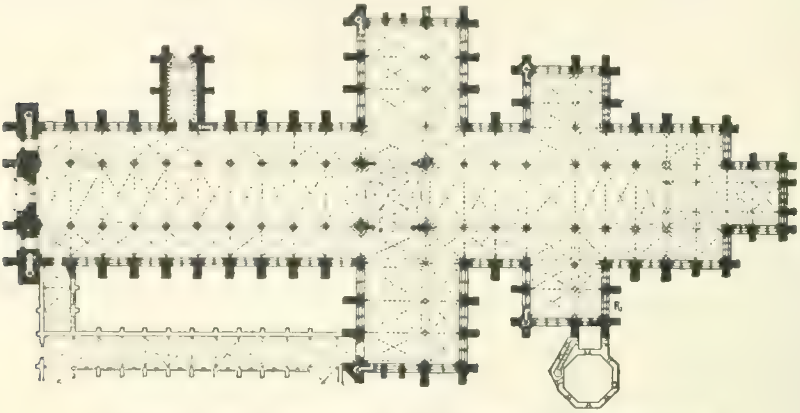
Parish Church. Primarily, one which serves the spiritual needs of a given district called a parish, which parish, if it is large, may require the establishment of an additional church building. (See Chapel of Ease.) In America, parishes are not commonly geographical divisions, and a parish church is one maintained by a certain body of trustees, or other corporation, which may keep up a principal church and several important buildings called chapels.

Patriarchal Church. One administered by a patriarch, as in the Greek Church, and as in the Roman Catholic Church, in the case of certain bishops who have this title; thus, the patriarchs of Aquilea, Lisbon, and Venice may confer the title of patriarchal upon their cathedral churches. Also, at Rome there are five churches representing the five great patriarchs of the Christian world in antiquity — Rome, Constantinople, Alexandria, Antioch, and Jerusalem. S. Giovanni in Laterano is that of Rome; the others are S. Peter's, S. Paul's without the Walls, S. Maria Maggiore, and S. Lorenzo without the Walls.

Pontifical Church. One where a bishop pontificates, or more usually confined to the church of the sovereign pontiff.

Round Church. (See the article under Round.)

The following is a chronological summary, prepared by Mr. Barr Ferree, of the more important churches of Western Europe, including those buildings, familiarity with which would give the student an acquaintance with the development of the ecclesiastical architecture. A capital C stands for the word "church," a small c for the word "century."



CHURCH: PLAN OF SALISBURY CATHEDRAL; TWO TRANSEPTS.

The order is by alphabet of countries, as follows: —

Austrian States (excluding Bohemia, Dalmatia, Hungary, and Istria)

Belgium
Bohemia
Dalmatia
Denmark
England
France
Germany
Hungary
Istria
Italy
Netherlands (Holland)
Norway
Portugal
Scotland
Spain
Sweden
Switzerland
Turkey

AUSTRIAN STATES

Agram. Croatia. Cathedral C. Built XIII–XIV c; choir vault XV c; 3 naves and apses; no transept.

Botzen. Tyrol. Parish C. Middle XIV c; rich flamboyant tower, open spire, done XVI c; aisles and nave of equal height.

Cracow. Galicia. Marienkirche. Begun XIII c; rebuilt XIV c; chapels XV–XVI c; brick; elongated choir without aisles; almost square nave (an Austrian type).

Gurk. Carinthia. Cathedral C. Second half XII c; elegant inner porch portals; magnificent crypt with 100 columns.

Lilienfeld. Lower Austria. Cistercian abbey C. Early XIII c; circular apse within later square; beautiful XII c cloister with 400 marble columns.

Salzburg. Cathedral C. Built 1614–1631 by Santino Solari; "baroque" C frequently copied in Austria and Germany.

Strassengel. Styria. Cistercian abbey C. XIV c; 3 naves and apses; no transept; open spire.

Trent. Southern Tyrol. Cathedral C. Parts N side XI c; rebuilt XII c; chiefly early XIII c; done XV c.

Vienna. S Stephan. Cathedral C. Begun XIII c; choir XIV c; nave, S tower, XIV–XV c; S tower rebuilt 1860–1864 in the original style; most important Austrian Gothic C.

BELGIUM

Antwerp. Notre Dame. Collegiate C; cathedral C from 1559. XIV–XV c; nave and aisle vaults XVII c; seven-aisled nave; narrow transepts; N tower (1422–1518) one of the most remarkable in Europe.

Brussels. SS Gudule et Michel. Collegiate C; now cathedral C. Choir XIII c; nave XIV c; W portal c 1499; chapel S Sacrement 1533–1539; notable carved wood pulpit by Verbruggen; fine glass windows.

Ghent. S Bavon ("Sint Baafs"). Cathedral C. Crypt X c, rebuilt XIII c; choir XIII c; tower XV–XVI c; chapels XV c; nave and transept XVI c; contains many great works of art.

Liège. S Jacques. Abbey C; now parish C. 1513–1538; beautifully painted vaults; one of the most perfect late Gothic churches.

Louvain. S Pierre. Collegiate C; now parish C. XV c; W towers destroyed XV c and partly rebuilt.

Mechlin. S Rombaut. Cathedral C. Choir XIV c; nave XV c; unfinished tower; one of the most impressive Belgian cathedrals.

Mons. S Waudru. Abbey C; now cathedral C. XV–XVI c; tower discontinued 1630; fine type of its period.

Tournay. Notre Dame. Cathedral C. Nave and transept XI–XII c; choir XII–XIII c; nave vault 1777; C of the first rank; one of the most splendid monuments in Belgium.

Ypres. S Martin. Collegiate C; cathedral C from 1559. Choir 1221; nave 1254; porch and tower XV c; chapel S Sacrement 1623; choir one of the most monumental of its period.

BOHEMIA

Kuttenberg. S Barbarakirche. XIV, XV, XVI c; incomplete; choir, chapels, E part nave only; 5 aisles.

Prague. S Veit. Cathedral C. XIV c; begun by French, continued by German masters; tower burned XVI c; incomplete; choir only.

DALMATIA

Trau. Virgin and S Doimo. Cathedral C. First half XIII c; nave vaults, XV c; spire XVI c; superb sculptured marble portals; Lombard Romanesque type.

Zara. S Anastasia. Cathedral C. Begun early XIII c; façade XIV c; crypt larger than C; Lombard Romanesque type; superb wood choir stalls.

DENMARK

Roeskilde. Cathedral C. Begun middle XII c; done end XIII c.

ENGLAND

Bangor. S Daniel. Cathedral C. Fragments XIII–XIV c; nave arcade, E part presbytery, W tower, XVI c.

Bath. SS Peter and Paul. Benedictine abbey C. Fragments XII c; rebuilt c 1496–c 1616; nave and aisle vaults XIX c.

Beverly. Secular collegiate C; choir XIII c; nave XIV c; W front close XV c; modern choir screen.

Bristol. Holy Trinity. Augustinian abbey C; cathedral C from 1542. Fragments XII c; elder Lady Chapel early XIII c; choir XIV c; central tower XV c; nave and W towers, XIX c.

—— S Mary the Virgin, Redcliffe. Parish C. Built 1292–1357 (S porch older); partly rebuilt XV c; graceful tower and spire.

Bolton. Augustinian priory C; nave now parish C. Parts of choir, transepts and nave XII c; N aisle early XIII c; E end choir and part transepts XIV c; W tower XVI c; ruined.

Boston. S Botolph. Parish C. Chiefly XIV c; beautiful XV c tower.

Cambridge. Chapel of King's College of SS Mary and Nicholas. Foundations 1446; chiefly 1508–1515; superb fan tracery vaults.

—— Great S Mary's. University C. Built 1478–1519; tower 1491–1608; modern porch.

Canterbury. Christ or Holy Trinity Church. Cathedral and Benedictine Monastery. Transept towers 1070–1109; crypt 1070–1109,

1178–1184; choir 1174–1184; retrochoir and corona 1178–1184; nave and W transept 1379–1400; central tower 1495–1503; S W tower 1418–1517; N W tower XIX c.

Carlisle. Augustinian priory C; cathedral C of the Holy and Undivided Trinity from 1540. Part nave, S transept, XI–XII c; W part choir XIII c; E part choir XIII–XIV c; N transept, summit central tower early XV c; 5 bays nave destroyed 1646.

Chichester. Holy Trinity. Cathedral C. Chiefly XII c; choir, XII–XIII c; outer aisles nave, middle XIII c; Lady Chapel XII–early XIV c; central tower XIII c; central spire begun XV c; fell 1861; rebuilt 1866; 5 aisles; unusual in England.

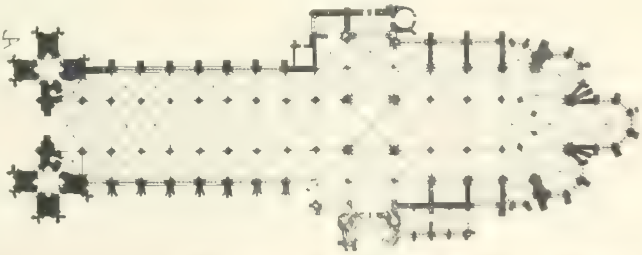
Coventry. S Michael. Parish C. First half XV c; beautiful tower and spire XIV–XV c; largest English parish C.

Durham. Christ and Blessed Mary the Virgin. Benedictine abbey C to 1540; cathedral C. Great transept, choir and aisles, save E bays, and roof XI c; W towers XII c; Galilee chapel latter half XII c; chapel 9 altars, XIII c; cloister XIV–XV c; upper part central tower XV c.

Ely. S Etheldreda. Cathedral C from 1109. Nearly done 1100; Galilee porch early XIII c; presbytery XIII c; beautiful central lantern and octagon and Lady Chapel XIV c; modern painted wood nave roof.

Exeter. S Peter. Benedictine monastery and cathedral C. Towers first half XII c; transformed and practically rebuilt XIII–XIV c; W front with sculptured screen.

Fountains. S Mary. Cistercian abbey C to 1539. Nave and transept XII c; choir XIII c; N transept tower, XV–XVI c; some windows XV c; ruined.



CHURCH OF S. OUEN. PLAN AS ORIGINALLY BEGUN (1320–1350).
West end with towers set diagonally. The chapels are [illegible]

Furness. S Mary. Cistercian abbey C to 1537. Central parts second half XII c; nave later; presbytery XV c; ruined.

Gloucester. Holy and Indivisible Trinity. Cathedral C from 1541. Choir, transept, nave, N aisle, XII c; nave vaults, XIII c; transepts cased, XIV–XV c; choir vaults, XIV c; W front, S porch, 2 bays nave, tower, Lady Chapel, XV c; E window (largest in England) middle XIV c; cloister XIV–XV c.

Great Malvern. SS Mary and Michael. Benedictine priory C. XI c; wholly remodelled XV c.

Hereford. SS Mary and Ethelbert. Cathedral C. Nave piers, choir to clerestory, XI–XII c; clerestory, choir vaults, N transept, XIII c; central tower, E transept, nave aisle walls, XIV c; outer N porch XVI c; W front, nave triforium, and clerestory XVIII c.

Church of S Petronio at Bologna: Nave: Close of 14th Century.

Hull. Holy Trinity. Parish C. Choir middle XIV c; nave, upper part crossing tower, early XV c; largest parish church in England save S Michael's, Coventry.

Kirkstall. S Mary. Cistercian abbey C. Chiefly XII c; ruined.

Lichfield. Blessed Virgin Mary and S Chad. Cathedral C. Chiefly XIII c; Lady Chapel and presbytery XIV c; central spire rebuilt XVII c; central and 2 W towers with spires.

Lincoln. Blessed Virgin Mary. Cathedral C. W wall XI c; additions W façade, part W towers, choir, E transept, E side W transept, XII c; nave, W transept, upper part W front, presbytery (Angel Choir), XIII c; top towers XIV c; W spires removed 1807; cloister XIII c.

London. S Clement Danes. Parish C. Built 1688 by Edward Pierce under superintendence of Sir Christopher Wren.

—— S Mary. Temple Church. Round part consecrated 1185; choir consecrated 1240.

—— S Mary le Strand. Parish C. Built by James Gibbs 1717; consecrated 1723.

—— S Martin in the Fields. Parish C. Built by Gibbs; begun 1722; spire done 1724.

—— S Paul. Cathedral C. Built 1675–1710; the masterpiece of Sir Christopher Wren; largest Protestant cathedral; one of the finest modern domes.

—— Southwark. S Mary Overy. S Saviour from 1540; Augustinian priory C to 1540; collegiate C from 1897. Built XII c; choir, Lady Chapel, nave vaults, XIII c; transept XIV c; nave removed and rebuilt XIX c.

—— Westminster. S Peter. Benedictine abbey C; now collegiate C. Choir, transept, E part nave, XIII c; W part nave, XIV–XV c; Henry VII's Chapel 1500–1512; W front remodelled 1722–1740; cloister XIII–XIV c.

—— W Smithfield. S Bartholomew the Great. Augustinian priory C; now parish C. XII c; remodelled early XV c; nave removed XVI c; tower 1628; choir and transept only.

Ludlow. S Lawrence. Parish C. Founded XIV c; chiefly XV c; fine tower.

Malmesbury. Holy Saviour, SS Peter and Paul. Benedictine abbey C; nave now parish C. XII c; clerestory XIV c; nave only remains.

Manchester. Collegiate and parish C of Christ; cathedral C of Blessed Virgin Mary, SS. George and Denys, from 1847. Nave early XV c; choir middle XV c; second aisle of nave last half XV c; Chetham Chapel, XVI c; W tower, XIX c.

Norwich. Holy and Undivided Trinity. Trinity. Cathedral priory C of Benedictine monastery. Choir, transept, nave, XI–XII c; choir, clerestory, XIV c; nave and choir vaults XV c: cloister XIII–XV c.

Oxford. Christ Church. Benedictine priory C; cathedral and college chapel from 1546. Fabric latter half XII c; Lady Chapel middle XIII c; "Latin" Chapel first half XIV c; nave and choir vault XV–XVI c.

—— SS Mary and John the Baptist. Merton College chapel. Choir begun c 1227; transept XIV c; top tower XV c; choir, transept, and tower only.

—— S Mary the Virgin. Rebuilt XII or XIII c; choir c 1462; nave 1490; nave roof and Lady Chapel modified early XVI c.

Pershore. Holy Cross. Benedictine abbey C; now parish C. Transept XII c; presbytery XIII c; transept vault XV c; nave destroyed XVI c; parts E end XIX c.

Peterborough. S Peter. Benedictine monastery; cathedral C from 1541. Chiefly XII c; remarkable W front of 3 vast arches, XIII c; triforium windows XIV c; "New Building" XV–XVI c.

Rievaulx. S Mary. Cistercian abbey C to 1538. Founded 1131; chiefly XII c; choir end XII c, beginning XIII c; ruined.

Ripon. SS Peter and Wilfrid. Abbey C; parish C; collegiate C; cathedral C from 1836. Saxon crypt; largely XII c; W front XIII c; presbytery end XIII c; parts central tower and choir XV c; nave aisles early XVI c.

Rochester. Christ and the Blessed Virgin Mary. Benedictine monastery and cathedral C. Part nave and crypt XI–XII c; rebuilt, W front, XII c; transepts and choir XIII c; some windows, nave, clerestory, and roof XV c; aisles rebuilt XVII c; central tower XIX c.

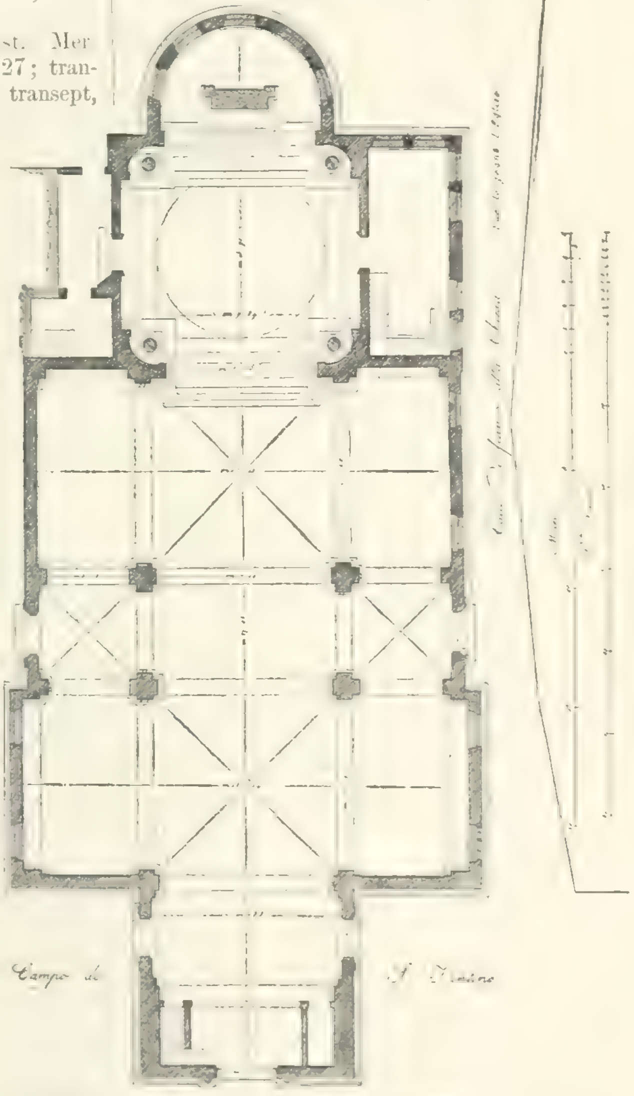
Romsey SS Mary and Aethelflaeda. Benedictine convent C. Choir, transept, part nave, XII c; W end nave XIII c; choir triforium, part N aisle, XV c.

Saint Albans. S Alban. Benedictine abbey to 1539; cathedral C from 1877. Central tower and transept XI c; chiefly XII c; W end nave, presbytery, XIII c; Lady Chapel XIV c; much changed in restoration.

Salisbury. Blessed Virgin Mary. Cathedral C. Almost entirely between 1220–1266; cloister 1263–1284; spire 1330–1375; only English cathedral built in one style and at one time.

Sherborne. S Mary. Benedictine abbey C. Fragments XII c; rebuilt XV c.

Southwell. Blessed Virgin Mary. Secular collegiate C; cathedral C from 1883. Nave, transept, central tower, door N porch, XII c; choir, N transept chapel, chapter house, XIII c; nave windows XV c; W spires, nave roof, XIX c.



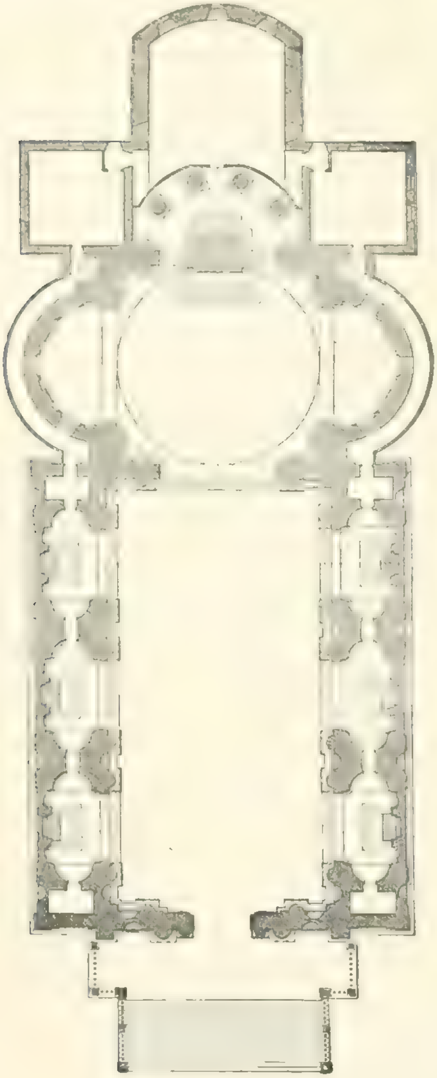
Church of S. Fantino, Venice; 1510–1533.

Tewkesbury. S Mary. Benedictine abbey C to 1539; now parish C. Early XII c; choir done early XV c; chapels XIII, XIV, XV c; wood spire fell 1559.

Tintern. S Mary. Cistercian abbey C. Founded XII c; cloister XIII c; rebuilt XIV c; ruined.

Waltham. Holy Cross. Augustinian abbey C; nave now parish C. Dedicated 1062; rebuilt after XII c. W front and tower, XIV c; presbytery and transept removed XVI c; nave only remains.

Wells. S Andrew. Cathedral C. Nave, transept, lower part W. bays choir, end XII c; W front XIII c; central tower, choir, Lady Chapel, XIV c; upper part W towers XIV–XV c; cloister XV c; most richly decorated English front.



Church of S. Redentore, Venice.

Winchester. Holy Trinity, SS Peter, Paul, and Swithin. Cathedral C and Benedictine monastery. Built XI c; E chapels XII c to early XIII c; presbytery piers and arches, nave remodelled, XIV–XV c; W front XIV c; presbytery remodelled and aisles rebuilt XVI c; longest mediaeval C.

Windsor. Virgin Mary, SS George and Edward, King and Confessor. Royal and collegiate Chapel within the Castle; now Royal Free Chapel of S George. XV c; largest English royal chapel; beautiful fan vaulting.

Worcester. Christ and the Blessed Mary the Virgin. Cathedral [and Benedictine priory] C. Crypt, parts nave, W part choir, transept walls, XI c; to last quarter XII c; 2 W bays nave last quarter XII c; choir, Lady Chapel, E transept, XIII c; nave, save 2 bays, XIV c; cloister XIV c.

Yarmouth. S Nicholas. Parish C. Founded c 1123; rebuilt middle XIII c.

York. S Peter. Cathedral C. W crypt XI c; E crypt XII c; transepts XIII c; nave, chapter house, XIII–XIV c; choir and presbytery 1361– *c* 1420; towers XV c; nave and choir vaults (wood) XIX c.

FRANCE

Abbeville. S Vulfran. Collegiate C; now parish C. Nave XV–XVI c; choir XVII c; façade is one of the most beautiful flamboyant fronts, richly decorated.

Albi. S Cécile. Cathedral C. Begun 1282; chiefly XIV c; rich S portal 1473–1501; fortified brick C; interior wall paintings XV–XVI c; beautiful choir screen.

Amiens. Notre Dame. Cathedral C. Begun 1220; choir 1235–1240; done 1269; upper part W façade XV c; flèche 1529–1533; chapels XIV c; magnificent carved wood stalls and portal sculptures; largest French cathedral.

Angers. S Maurice. Cathedral C. Lower part nave XI c; nave vault (domical) middle XII c; N transept XIII c; choir 1274; W towers rebuilt XVI c.

Angoulême. S Pierre. Cathedral C. Chiefly early XII c; repaired XIV, XV, XVI c; domical C; W front sculptured throughout with Last Judgment.

Arles. S Trophime. Cathedral C to 1801. "Église Primatiale." XI–XII c; choir 1430; beautiful cloister, XII, XIII, XIV c; elaborately sculptured portal.

Auch. S Marie. Cathedral C. XV–XVI c; W towers and façade 1685; magnificent carved wood choir stalls and glass of XVI c.

Autun. S Lazare. Cathedral C. Romanesque body (XII c) enclosed with Gothic chapels *c* 1465; central tower and spire *c* 1465.

Auxerre. S Étienne. Cathedral C. Crypt XI c; choir XIII c; nave and transept XIV–XV c; lower façade XIII c; upper part XV c; N tower beginning XVI c.

Bayeux. Notre Dame. Cathedral C. Fragments of XI–XII c; chiefly middle XIII c; tower XV c with modern dome.

Beauvais. S Pierre. Cathedral C. Choir 1240–1272; transepts XVI c; highest vault in France; incomplete; joined to old cathedral called "*la Basse-Œuvre*" built before XI c.

Bordeaux. S André. Cathedral C. "Eglise Primatiale." Lower parts of nave XI–XII c; choir 1260–1310; towers and transepts XIV c; nave vaults XVI c; tower Pey-Berland (isolated) 1440.

—— S Michel. Parish C. XV–XVI c; isolated tower 1472–1492, with modern spire.

Bourges. S Étienne. Cathedral C. Crypt and side portals XII c; chiefly XIII–XIV c; nave chapels XV c; 5 aisles, 5 W portals (unique); no transept.

Braisne. S Yved. Dependence of Premonstratensian abbey; now parish C. Begun end XII c; done early XIII c; W bays nave removed XIX c; one of the most charming French rural churches.

Brou. S Nicolas de Tolentin. Augustinian abbey C; now seminary chapel. Built 1506–1536; architects, Jehan Perréal (1506–1512), Van Boghem (1513–1536); remarkable C with notable tombs of French princes; beautiful glass. Near Bourg-en-Bresse.

Caen. S Pierre. Parish C. XIV c; retouched XV c; tower, prototype of XIV c Norman towers; apse chapels XVI c; elaborately decorated in flamboyant style.

—— S Étienne. "Abbaye aux Hommes." Benedictine abbey C. Begun by William the Conqueror 1066; nave and tribune vaults middle XII c; W spires beginning XIII c; choir XIII c; nave injured XVI c; rebuilt XVII c; central tower removed XVI c.

—— La Trinité. "Abbaye aux Dames." Benedictine abbey C. Founded 1062 by Mathilda; contemporary with S Étienne; almost wholly rebuilt XII c; S transept chapel XIII c.

Carcassonne. S Nazaire. Cathedral C to 1802. Nave XII c; choir and transept, 1310–1320; W front fortified; E part an exquisite and delicate type of Gothic.

Chartres. Notre Dame. Cathedral C. S tower done c 1170; burned 1194 (crypt, façade, towers survived); rebuilt, choir dedicated, 1198; transept porches 1230–1240; consecrated 1260; N spire 1506–1514; beautiful sculptured choir screen XVI–XVIII c.

Civray. S Nicolas. XI c; upper part W façade XV c; W front richly sculptured.

Clermont-Ferrand. Notre Dame du Port. Collegiate C; now parish C. Date uncertain, probably XI c; fine type of Auvergne Romanesque; tribune over aisles with half barrel vaults buttressing nave vaults.

Conques. S Foi. Benedictine abbey C. XII c; grand C in Auvergne Romanesque; tribunes all around interior.

Coutances. Notre Dame. Cathedral C. Built 1205–1238; chapels 1251–1274; beautiful central lantern and tower; Norman type of cathedral.

Dijon. Notre Dame. Parish C. XIII c; high W façade of two series of arches over open porch; fine type of Burgundian C.

Évreux. Notre Dame. Cathedral C. Parts nave XI–XII c; upper parts nave early XIII c; XIII–XIV c choir larger than nave; magnificent central tower XVI c; exterior much changed in restoration.

Fontevrault. Notre Dame. Abbey C, called "Grand Moutier"; now prison. XII c; cloister repaired XVI–XVII c; domical church.

Issoire. S Austremoine. Benedictine abbey C; now parish C. Same character as Notre Dame du Port, Clermont, slightly later in date; modern façade and towers.

La Charité. S Croix. Cluniac priory C. Begun end XI c; nave burned XVI c; 4 bays rebuilt 1695; choir repaired XVII c.

La Ferté Bernard. Notre Dame des Marais. Parish C. Nave, transept, tower, 1450–1500; choir aisles, apse chapels, XVI c; spire destroyed 1740; fine flamboyant C.

Laon. Notre Dame. Cathedral C. to 1801. Built early XII c; choir, transept, nave, rebuilt 1155–1174; remodelled early XIII c; 6 towers carried above roof; one of the most beautiful early XIII c churches.

Le Dorat. S Marie. Abbey C. End XI c; first quarter XII c; tower beginning XIII c; one of the finest Romanesque churches in central France.

Le Mans. S Julien. Cathedral C. W façade, aisle walls and vaults, base S tower, XI c; upper parts nave, transept piers, 1150; choir (largest in France) 1217–1254; S transept XIV c; N transept, upper part S tower, XV c; superb glass.

Le Puy. Notre Dame. Cathedral C. XI–XII c; parts of cloister much older; nave vaulted with unique domes; exterior in black and white with mosaic patterns; fine group of dependent buildings.

Lisieux. S Pierre. Cathedral C to 1799. Church of XII c, rebuilt in XIII c; nave chapels XIV c; Lady Chapel 1430; repairs XVI c; type of Norman transition.

Loches. S Ours. Collegiate C; now parish C. Chiefly XII c; first bay nave X c; nave aisles XII and XV c; unique nave roof of 2 towers and 2 pyramids.

Lyons. S Martin d'Ainay. Benedictine abbey C to 1790; now parish C. X–XI c; a 5-aisled church with outer aisles of XII or XIII c.

—— S Jean. Cathedral C. "Eglise Primatiale." Choir early and end of XII c; nave XIII c; W façade XIV–XV c; towers at side of choir done 1480.

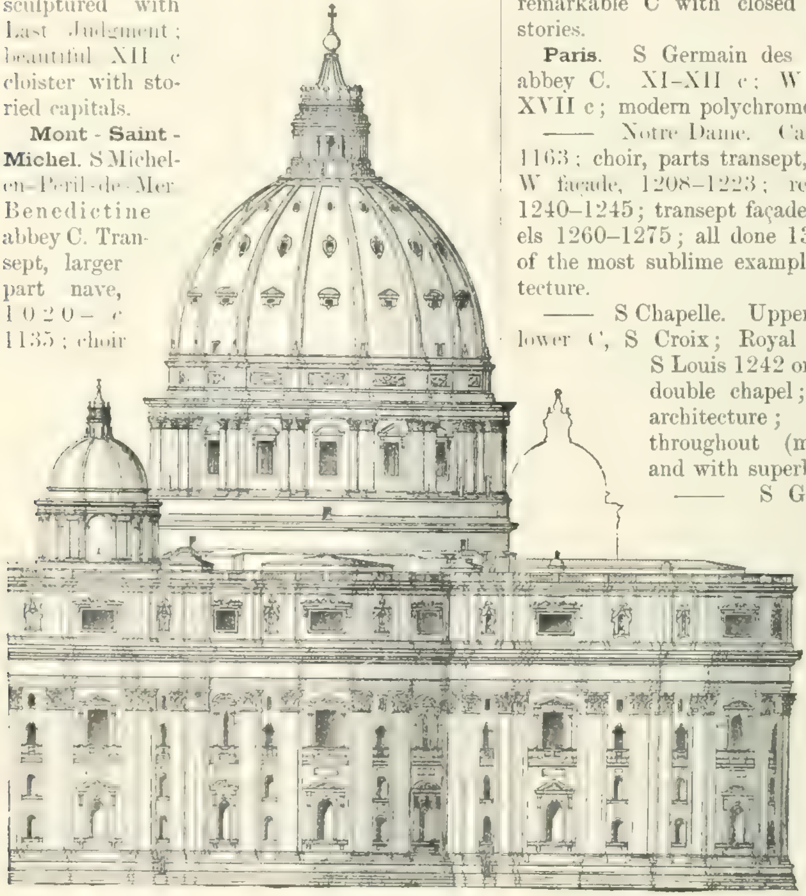
Mantes. Notre Dame. Collegiate C. XII c; façade XIII c; choir chapels XIV c; a reduced copy of Notre Dame at Paris.

Meaux. S Etienne. Cathedral C. Choir middle XIII c; nave XV–XVI c.

Melle. S Hilaire. Benedictine priory C. Apse, ambulatory chapels, XI c, nave XII c, W façade with ranges of richly sculptured arches.

Moissac. S Pierre. Benedictine abbey C Augustinian abbey C from 1618. Rebuilt XV c on site of C dedicated 1060; S portal XII c, elaborately sculptured with Last Judgment; beautiful XII c cloister with storied capitals.

Mont-Saint-Michel. S Michel-en-Peril-de-Mer Benedictine abbey C. Transept, larger part nave, 1020–c 1135; choir 1450–1521; part nave destroyed 1776; cloister done 1288; one of the most picturesquely situated churches in Europe, with complete and extensive monastic buildings.



Church of S Peter. Part of North Front, showing Choir (turned to the West). Northern Apse. Colossal Order and Attic; all of 1556. Cupola of circa 1590.

Narbonne. S Just. Cathedral C to 1801. Choir 1270–1320 (only part finished); W end (fragments) begun 1708.

Nevers. S Etienne. Benedictine abbey C; now parish C. Chiefly XI c.

Notre Dame de l'Épine. Votive C. A superb example of the florid Gothic of the second half of XV c.

Noyon. Notre Dame. Cathedral C to 1801. Second half XII c; upper part towers XIII c; W porch XIV c; transepts terminated with circular apses.

Orcival. Notre Dame. Secular priory C; collegiate C from 1242; now parish C. XI c; similar to Notre Dame du Port, Clermont; octagonal tower XIII c.

Paray-le-Monial. Notre Dame. Benedictine priory C; now parish C. Chiefly XII c; remarkable C with closed W porch of two stories.

Paris. S Germain des Prés. Benedictine abbey C. XI–XII c; W door, nave vault, XVII c; modern polychrome decoration.

—— Notre Dame. Cathedral C. Begun 1163; choir, parts transept, nave, done 1196; W façade, 1208–1223; repairs and changes 1240–1245; transept façades 1257; nave chapels 1260–1275; all done 1351; 5 aisles; one of the most sublime examples of Gothic architecture.

—— S Chapelle. Upper C, La S Couronne; lower C, S Croix; Royal Chapel. Built by S Louis 1242 or 1245; done 1247; double chapel; a gem of Gothic architecture; upper C painted throughout (modern restoration) and with superb glass.

—— S Germain l'Auxerrois. Royal C; now parish C. Tower XII c; W façade, choir, apse, first half XIII c; outer S aisle, nave chapels, XIV c; porch, part W façade, nave, transept, choir chapels, XV–XVI c.

—— S Étienne du Mont. Parish C. Begun 1517; choir done 1557; W portal begun 1610; famous jubé by Biard le père 1600–1609.

—— S Eustache. Parish C. Begun 1532; done, save portal, 1642; W portal 1755–1788; unique application of Renaissance detail to Gothic forms.

—— S Séverin. Parish C. Side portal, tower porch, parts aisles, and nave early XIII c; tower, outer S aisle, XIV c; remaining parts and general rebuilding 1489–1498.

—— S Sulpice. Parish C. Begun 1646; continued 1670, 1719, 1733, 1745; a vast church; one of the most notable of later Parisian churches.

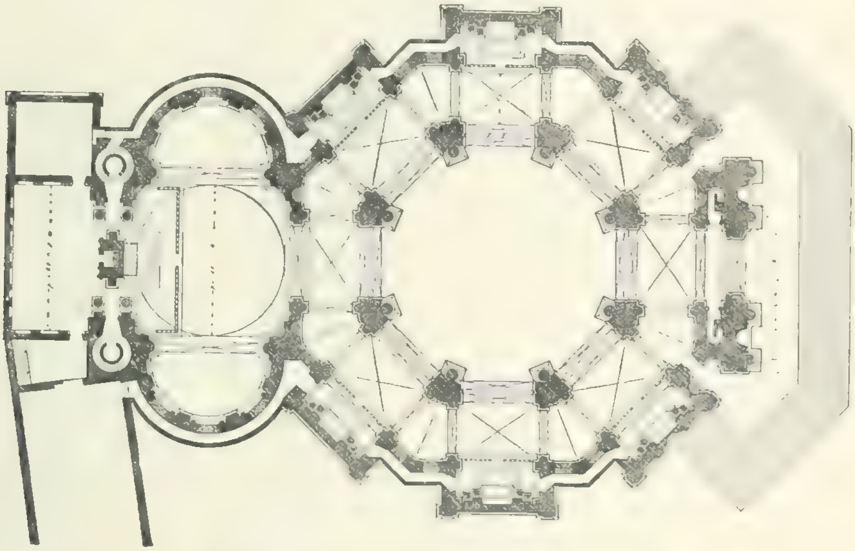
—— Panthéon. Former Church of S Gene

viève. Begun 1764 by Soufflot; a great modern church, now secularized; wall paintings by modern French masters.

Périgueux. S Front. Abbey C (uncertain if Benedictine or Augustinian); cathedral C from 1669. First half XII c; greatly changed by modern restoration; modelled on S Mark's, Venice; undecorated interior.

Poitiers. S Pierre. Cathedral C. Begun 1162; nearly done 1204; W façade XIII c; upper part N tower XV c; unusually wide W front; "Angevin" vaults of domical form.

—— Notre Dame la Grande. Collegiate C. Chiefly XI c; parts N wall nave IX or X c; nave chapels XV–XVI c; central part W front repaired XV c; W front sculptured throughout.



Church of S. Maria della Salute, Venice.

—— S Hilaire. Collegiate C. XI–XII c; mutilated 1562; 7-aisled nave destroyed in Revolution and rebuilt 1855–1876.

Pontigny. Cistercian abbey C. Begun middle XII c; restored, after fires, 1615–1630; remarkably homogeneous; apparently built at one time.

Pontoise. S Maclou. Parish C. Apse, part transept, middle XII c; façade XV c; transformed XVI c.

Provins. S Quiriac. Collegiate C. Begun 1160; choir XII–XIII c; transept portals XIII c; modern dome; no façade.

Reims. Notre Dame. Cathedral C. Begun 1212; choir nearly done 1241; nave and W façade XIV c, on plans of XIII c; W towers 1428; superb sculpture in all parts.

—— S Remi. Benedictine abbey C. Chiefly XI c; apse, portal, 2 bays nave, XII c; S transept XV c.

Rodez. Notre Dame. Cathedral C. Begun 1277; choir done XV c; nave done XVI c; W façade, c 1530; transept tower 1510–1526; no W portal.

Rouen. Notre Dame. Cathedral C. Parts W façade, c 1170; chiefly 1202–1220; transept portals 1280–1488; upper part N tower 1467; S tower 1485–1517; modern central iron spire.

—— S Ouen. Benedictine abbey C; now parish C. Choir, part transept, 1318–1338; nave XV c; beautiful central lantern and tower done end XV c; walls almost wholly filled with glass; W façade 1846–1852.

—— S Maclou. Parish C. Begun 1437; done beginning XVI c; modern spire; richly ornamented porch, with carved wood doors.

Saint-Avit-Sénieur. Abbey C. XII c; derived from S Front, Périgueux; domes replaced with domical vaults XIII c.

Saint-Benoît-sur-Loire. S Marie. Benedictine abbey C. W porch XI c; chiefly XII c; nave vault 1218; majestic W porch in 2 stories; one of the most important French Romanesque churches.

Saint-Denis. S Denis. Benedictine abbey C. XII c; restored end XII and beginning XIII c; upper parts choir, transept, and nave rebuilt 1231; burial place of French kings; many notable monuments.

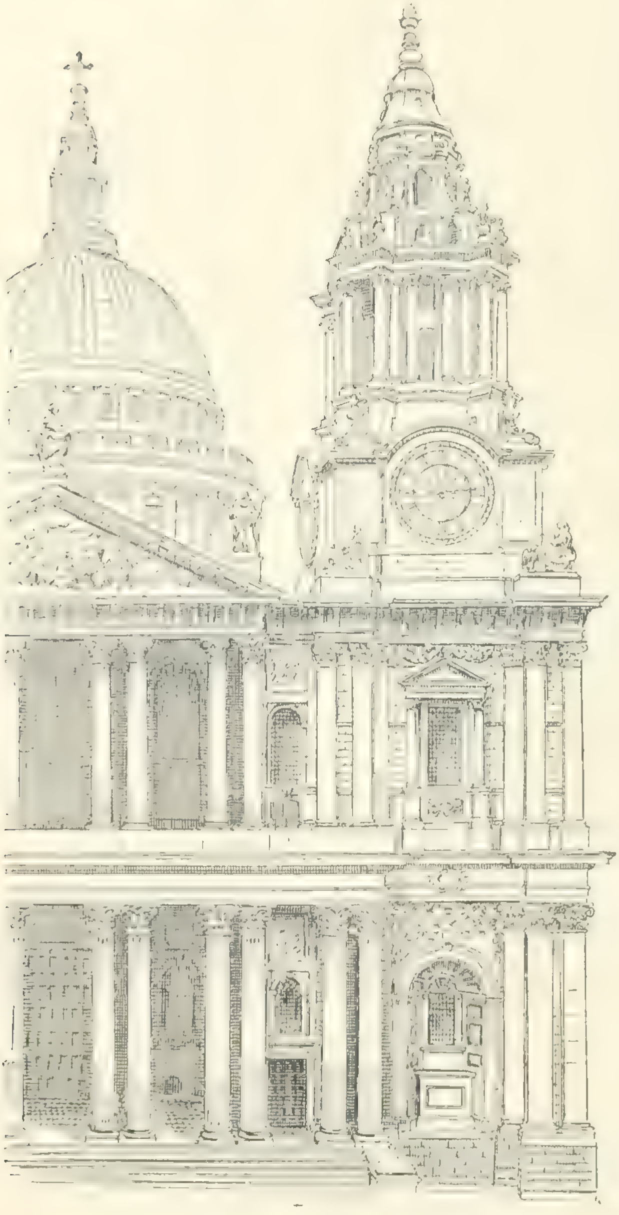
Saintes-Maries-de-la-Mer. Notre Dame. Parish C. Fortified church of XII c.

Saint-Leu d'Esserent. Benedictine priory C. Narthex XI c; choir end XII c; nave beginning XIII c; remarkable transition monument.

Saint-Lô. Notre Dame. Augustinian abbey C. XIV–XVI c; N tower XIII or XIV c; S tower, XV or XVI c; spires XVII c.

Saint-Martin-de-Boscherville. S Georges. Benedictine abbey C. XI c; vaults rebuilt XII c; salle capitulaire 1157–1200; cloister (fragments) XIV c.

Saint-Père-sous-Vézelay. S Pierre. Benedictine C; now parish C. XIII c; porch partly XIV–XV c; Burgundian type of Gothic; charming tower.



Church of S. Paul: South Part of West Front.

Saint-Pierre-sur-Dives. S Marie. Benedictine abbey C. Tower XII c; chiefly XIII, XIV, XVI c; apse chapels XIII c.

Saint-Pol-de-Léon. Notre Dame du Creizker. Chapel. Choir, tower, nave, XIV c; aisles and side porches middle XV c; tower the prototype of several in the region.

Saint-Quentin. Notre Dame. Collegiate C. Base of porch, early XII c; choir XIII c; nave XV c; nave chapels XIV–XV c; double transepts.

Saint-Riquier. S Riquier. Benedictine abbey C. Chiefly end XV and XVI c (fragments XIII c); tower XIII or XIV c.

Senlis. Notre Dame. Cathedral C to 1801; now parish C. Built 1145–1183; spire XIII c; chapels XIV c; upper parts repaired and transept finished XVI c.

Sens. S Étienne. Cathedral C. Built 1140–1168; S tower and portal XIII c; S transept portal 1489–1497; N transept portal 1501–1515; top S tower XVI c.

Soissons. SS Gervais et Protais. Cathedral C. Built 1160–1170; S transept 1176; choir done early XIII c; nave chapels XIV c; one arm transept, semicircular.

Toul. S Gengoult. XIII c; W façade XV c; cloister first half XVI c.

Toulouse. S Saturnin; popularly S Sernin. Secular abbey C. Sanctuary XI c; nave XII c; rebuilt as originally in XIII c; remarkable central tower, brick; largest church in southern France.

Tournus. S Philibert. Benedictine abbey C; Nave and narthex beginning XI c; largely XI c; transept and tower XII c; minor parts XIV or XV c.

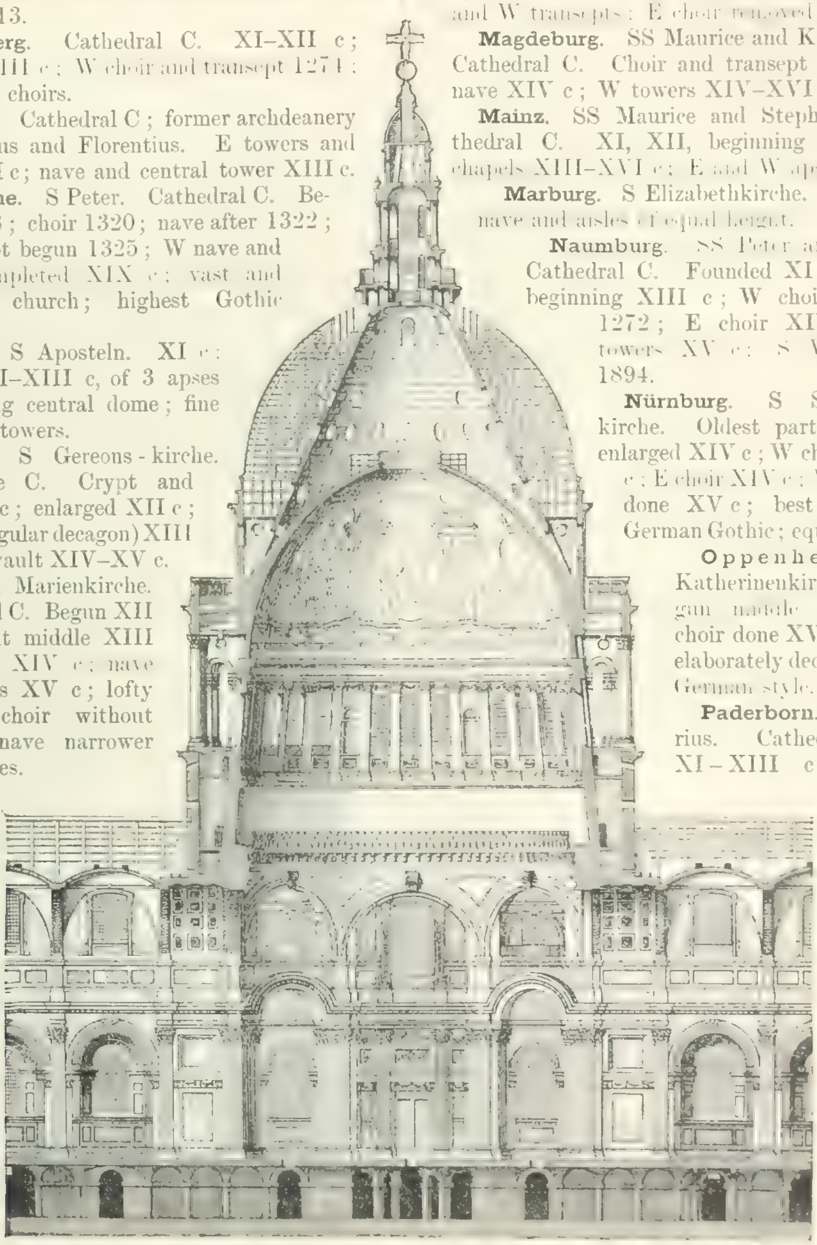
Tours. S Gatien. Cathedral C. Begun c 1175; chiefly XIII c; continued XIV, XV, XVI c; W façade 1426–1547; N tower done 1507; S tower done 1547; panelled W front.

Troyes. SS Pierre et Paul. Cathedral C. In rebuilding 1214; choir and part transept XIII c; transept XIV c; nave XV c; W façade XVI c.

——— S Urbain. Collegiate and papal C; now Parish C. Begun 1262; character of XIV c; nave unfinished; a *chef-d'œuvre* of Gothic art.

Vendôme. La Trinité. Benedictine abbey C. XII–XV c; nave XIV–XV c; nave chapels 1341 and 1545; choir begun c 1275; isolated tower middle XII c.

Vézelay. La Madeleine. Benedictine abbey C. Nave 1096–1104; narthex 1128; choir 1198–1206; upper part W façade XIII c; a grand church.



Church of S. Paul in London. Section through Cupola, showing Inner Cupola, Brick Cone, and Wooden Outer Shell, Stone Lantern resting on Brick Cone. Work of Sir Christopher Wren, 1680 to 1710 a.d.

GERMANY

Aachen. Cathedral C. Octagonal church by Charlemagne, 793–804, with gables of beginning XIII c and roof of XVII c; choir 1353–1413.

Bamberg. Cathedral C. XI–XII c; rebuilt XIII c; W choir and transept 1274; E and W choirs.

Bonn. Cathedral C; former archdeanery SS Cassius and Florentius. E towers and choir XII c; nave and central tower XIII c.

Cologne. S Peter. Cathedral C. Begun 1248; choir 1320; nave after 1322; S transept begun 1325; W nave and front completed XIX c; vast and splendid church; highest Gothic vault.

—— S Aposteln. XI c; choir XII–XIII c, of 3 apses supporting central dome; fine group of towers.

—— S Gereons-kirche. Collegiate C. Crypt and choir XI c; enlarged XII c; nave (irregular decagon) XIII c; choir vault XIV–XV c.

Erfurt. Marienkirche. Cathedral C. Begun XII c; rebuilt middle XIII c; choir XIV c; nave and aisles XV c; lofty slender choir without aisles; nave narrower than aisles.

Freiburg. (Baden) Marienkirche. Cathedral C. Built 1230–1288; superb pierced spire 1270–1300.

Halberstadt. S Stephan. Cathedral C. Begun *c* 1179; consecrated after rebuilding

1220; W parts nave XIII c; choir XIV–XV c; W towers rebuilt 1896.

Hildesheim. S Michaelskirche. Benedictine abbey C; now Protestant parish C. Early XI c; rebuilt in XII and XIII c; E and W transepts; E choir removed 1560.

Magdeburg. SS Maurice and Katharine. Cathedral C. Choir and transept XIII c; nave XIV c; W towers XIV–XVI c.

Mainz. SS Maurice and Stephan. Cathedral C. XI, XII, beginning XIII c; chapels XIII–XVI c; E and W apses.

Marburg. S Elizabethkirche. XIII c; nave and aisles of equal height.

Naumburg. SS Peter and Paul. Cathedral C. Founded XI c; nave beginning XIII c; W choir 1248–1272; E choir XIV c; 3 towers XV c; S W tower 1894.

Nürnburg. S Sebalduskirche. Oldest parts XI c; enlarged XIV c; W choir XIII c; E choir XIV c; W towers done XV c; best type of German Gothic; equal aisles.

Oppenheim. S Katherinenkirche. Begun middle XIII c; choir done XV c; nave elaborately decorated in German style.

Paderborn. S Liborius. Cathedral C. XI–XIII c; chiefly XIII c; great W tower (no entrance) XI c.

Regensburg. S Peter. Cathedral C. Choir 1275–1280; S tower XV c; W façade XV c; W towers done 1859–1869; most charming German Gothic cathedral.

Speyer. Cathedral C. Crypt XI c; chiefly XII c; most important German Romanesque C; grand dimensions; typical Rhenish cathedral.

Strasburg. S Maria. Cathedral C. Parts apse, fragments, beginning XII c; transept middle and end XII c; nave and choir XIII c; chapels XIII–XIV c; spire 1439; W front a high traceried screen.

Trier. Liebfrauenkirche. 1227–1243; tower 1492; polygonal church; unique plan and construction; vaults supported by angle piers of chapels without flying buttresses.

Ulm. Cathedral C. Begun 1377; nave done 1470; tower XIV–XVI c; completed XIX c; outer walls and buttresses panelled with tracery.

Worms. SS Peter and Paul. Cathedral C. Chiefly XII c; S portal XIV c; N E tower restored, XV c; cloister removed, 1813; E and W apses.

HUNGARY

Kaschau. Cathedral C. XIV–XV c; most important Hungarian Gothic C; square, with polygonal choir.

Oedenburg. Benedictine abbey C. XIV–XV c; by German masters; fine tower; plan similar to Cracow.

ISTRIA

Parenzo. Cathedral C. VI c; retains original atrium and baptistery; rare example of a complete VI c basilica; most important C on E shore of Adriatic.

ITALY

Assisi. S Francesco. Franciscan monastery C. Double C; begun 1228; lower C done 1232; upper C dedicated 1253; one of the earliest Gothic churches in Italy; superbly frescoed by many early Italian masters.

Asti. S Maria Assunta. Cathedral C. Chiefly first quarter XIII c (fragments XI c); S porch early XVI c; isolated campanile.

Bari. S Sabino. Cathedral C. Part transept and E end X c; rebuilt XI, XII, XIII c; interior XVIII c; 9-aisled crypt.

Bologna. S Petronio. Begun 1390; continued to middle XVII c; unfinished; present C is nave of projected building; many of the most famous architects of XIV and XV c have laboured on it.

Chiaravalle. Cistercian abbey C to 1797. XII–XIII c; Lombard C with enriched central octagonal tower.

Como. Cathedral C. Nave begun 1396; façade XV c; choir and transept XVI c; cupola XVIII c; beautiful C with elegant detail; one of the finest in north Italy.

Ferrara. Cathedral C. Chiefly XII c; additions XIII–XIV c; interior XVII c; campanile XV–XVI c; Lombard C; W façade a monumental screen with ranges of arches; 2 transepts; interior modernized.

Florence. S Maria dei Fiore. Cathedral C. Begun 1296; by Arnolfo di Cambio, tower (Giotto, 1334–1337) done 1351; dome (Brunelleschi) 1420–1436; lantern 1445–1461; earliest modern dome; outer walls panelled in mosaic; baptistery (S Giovanni Battista), XII c.

—— S Maria Novella. Dominican C. Begun 1278; façade of red and white marble 1448–1470 by Alberti; notable frescoes by early Italian masters.

—— S Miniato al Monte. Benedictine abbey C. Begun 1013; façade restored XIV c; campanile 1519; illustrates transition from basilica to Romanesque type; interior walls in mosaic patterns; wood roof; outer walls veneered in coloured marble.

Fossanuova. Cistercian abbey C to 1812; now Carthusian. Built 1187–1208; façade, middle XIII c; cloister end XIII or beginning XIV c; perhaps best remaining representative of an Italian mediæval monastery.

Genoa. S Lorenzo. Cathedral C. Chiefly XII c; restored XIV c; crossing lantern and top campanile XVI c; façade and nave arches of black and white marble strips.

Lucca. S Martino. Cathedral C. XI–XII c; choir XIV c; arcaded W façade, richly decorated, begun 1204; majestic interior; Lombard C of Pisan type.

Mantua. S Andrea. Masterwork of Alberti 1470–1476; dome 1782, earliest type of Renaissance C; fine proportions and elegant detail.

Milan. S Ambrogio. Monastery C. Upper parts and apse rebuilt, nave restored, 824–859; restoration and atrium 868–881; nave rebuilt second half XII c.

—— S Mariæ Nascente. Cathedral C. Begun 1386; choir consecrated 1418; cupola 1490–1522; W end nave 1685; spire 1772; façade XIX c; largest Gothic C save Seville cathedral; brick, veneered with white marble; many statues; painted vault tracery; one of the most impressive interiors in Europe.

Modena. Cathedral C. Chiefly XII c; much sculpture on façade and at portals; one of the most notable Italian towers (XIII–XIV c).

Monreale. Benedictine abbey C; cathedral C from 1582. Built *c* 1175–1182; one of the finest monuments of Norman art in Sicily; interior covered with magnificent mosaics; Latin form, Roman colonnade, Byzantine mosaics, Greek sculpture, Saracenic and Norman detail.

Murano. S Donato. Cathedral C. From middle X c; probably chiefly XII c; interior modernized, inlaid pavement (XII c).

Orvieto. S Maria. Cathedral C. Begun 1290; one of the most remarkable Gothic churches; façade superbly sculptured and decorated with mosaics; interior with many great frescoes.

Otranto. S Maria Annunziata. Cathedral C. X, XI, XIII c; remarkable crypt of nine aisles, mosaic pavement of 1163.

Padua. S Antonio ("Il Santo"). 1231–1307 by Niccolo da Pisa; nave and transept Romanesque; aisles, façade, save door, choir, apse, Gothic, Lady Chapel Renaissance; Oriental-like church with 7 domes; gorgeous interior with much painting and many shrines.

Palermo. S Rosalia. Cathedral C. "The Matrice" XII c; many changes XIII, XIV, XV c; external character of XIV c; interior modernized (dome) 1730–1801.

Parma. S Maria Assunta. Cathedral C. Crypt X c; built middle XI c; largely rebuilt XII c; Lombard Romanesque; magnificent W front; much colour on exterior; interior frescoes by Correggio and his pupils.

Pavia. Certosa. Carthusian monastery C. Begun 1396; continued to beginning XVI c; splendidly decorated façade begun 1491; most magnificent monastery in the world; interior with many great pictures.

—— S Michele. Date uncertain; probably XI–XII c; fine type of Lombard Romanesque.

Piacenza. S Giustina. Cathedral C. XII–XIII c; crypt with many columns; fine choir stalls.

Pisa. S Reparata. Cathedral C. Begun *c* 1063; consecrated 1118; campanile (Leaning Tower) 1174; tower belfry 1380; baptistery 1153–1278, XIV c; one of the most notable groups in Italy; of white marble beautifully tinted by age; walls have many subtle curves and variations.

Church of S. Roch, Paris. Nave; circa 1660 a.d.

Pistoia. S Jacopo. Cathedral C. Built *c* 1150; probably partly rebuilt *c* 1272; beautiful XII c campanile; contains many notable paintings; interior modernized.

Prato. Cathedral C. XII c; enlarged by G Pisano *c* 1317; campanile completed 1340; external pulpit by Donatello 1434; inlaid with black and green serpentine and white marble; fine frescoes by Filippo Lippi.

Ravenna. S Apollinare Nuovo. Originally Arian cathedral C. Basilica. Built 500 by Theodoric; apse IX *c*; portico XVI *c*; magnificent mosaics chiefly 533–566.

Ravenna. S Apollinare in Classe. Basilica. Begun 534 by "Julianus Argentarius"; consecrated 549; mosaics 671–677.

—— S Vitale. Begun 526 by "Julianus Argentarius"; consecrated 547; narthex destroyed 1688; octagonal church with some fine mosaics.

Rome. S Agnese fuori le Mura. Basilica. Suburban regular parish C. Founded by Constantine; rebuilt 626–640; restored 1490.

—— S Clemente. Basilica. Now Irish Dominican C. Rebuilt 1125; consecrated 1128; choir screen VI c; lower C contains V to XI c frescoes; rests on fragments of primitive Christian C; best extant type of early Roman basilica.

—— S Giovanni in Laterano. Basilica. Ancient Episcopal C; secular parish C. XIV c; restored XV c; interior entirely rebuilt 1644–1655; Capella Corsini and main façade 1734; tribune and chair enlarged 1875–1885; beautiful cloister early XIII c.

—— S Lorenzo fuori le Mura. Basilica. Suburban regular parish C. E end by Constantine; W end 432–440; joined and restored 1216–1227; presbytery 1254; cloister XII c.

Rome. S Maria in Cosmedin. Diaconal C; secular parish C. Built 772–795; restored and reconsecrated 1123; façade 1718; campanile VIII or IX c.

—— S Maria Maggiore. Liberian Basilica (Basilica Major). Secular parish C. Founded IV c; rebuilt 432; W campanile rebuilt 1375; chapels from XIII c; W façade and interior XII c, renewed XVIII c; repairs XIV c; Borghese Chapel 1611.

—— S Maria in Trastevere. Secular parish C. Rebuilt 1130; portico, XVIII c, by Fontana.

—— S Paolo fuori le Mura. Basilica Ostiensis. Suburban regular parish C. Built by Constantine; rebuilt 386; burned 1823; rebuilt, reconsecrated, 1854; cloister early XIII c.

—— S Pietro in Vaticano. Basilica. Secular parish C. Begun 1450; Bramante 1506–1514; Raphael 1514–1520; Peruzzi 1520–1536; Sangallo 1536–1546; G Romano 1546; Michelangelo 1546–1564 (dome); Giacomo della Porta 1588–1604 (dome done 1590); Carlo Maderno 1604 (nave and façade done 1614); largest Christian C.

Siena. S Maria Assunta. Cathedral C. Begun *c* 1245; cupola done 1264; choir prolonged 1317; great extension begun 1339; façade 1284–1380; designed by G Pisano, one of the most notable Italian churches and one of the most sumptuous interiors; superbly sculptured and decorated façade; contains pulpit by N Pisano; mosaic pavement by Beccafumi (*c* 1369); many great works of art.

Torcello. S Maria. Cathedral C. Apse VII c; crypt, small apses, part walls IX c; rebuilt or restored XI c; choir (1008) repaired second half XII c; interior modernized.

Toscanella. S Pietro. Cathedral C. Founded 628; chiefly XI c; unusual type; interior has many Roman columns; curious sculptures on W front.

Venice. S Giorgio Maggiore. Benedictine abbey C. Built 1560–1610 by Palladio; a masterpiece of its architect.

—— SS Giovanni e Paolo (locally S Zanipolo). Dominican C. Begun 1234; consecrated 1430; the Venetian "Westminster Abbey" with many notable monuments; one of the most important Venetian Gothic churches.

—— S Marco. Ducal chapel. Cathedral C from 1807. Built X–XI c; additions XIV c; mosaics restored XVII c; cruciform C with 5 domes; splendidly decorated throughout with gorgeous mosaics; isolated campanile IX–XVI c; loggia of campanile by Sansovino 1540.

—— S Maria Glorioso dei Frari. Franciscan C. Begun 1250; done 1280; tower XIV c; a remarkable brick C; many fine tombs of Doges; the Venetian "Pantheon."

Venice. S Maria della Salute. Votive C. Built 1632 by Baldassare Longhena; unusual plan of 2 domes; superbly placed at entrance of Canal Grande.

Verona. S Maria Matricolare. Cathedral C. XII c; substantially rebuilt; especially interior, XIV c; interior, choir, screen, S chapels, XVI c; magnificent XII c porch.

NETHERLANDS, KINGDOM OF THE

Haarlem. S Bavon. "Groote Kerk." Built XV c; spire and wood vaults XVI c.

Utrecht. S Martin. Cathedral C. XIII c; detached tower XIV c; nave fell 1674.

NORWAY

Hitterdal. Wood C of XI or XII c; a characteristic type of early Norwegian C; richly interlaced carved wood detail.

Trondhjem. Cathedral C. Transept XII c; largely XIII c; interior E end XIV c.

PORTUGAL

Batalha. Mosteiro da S Maria da Victoria. Built 1385; done before 1440; a florid type of Gothic.

Belem. S Maria. Convento dos Jeronymos de Belem. Built 1517–1551; choir 1551; florid Gothic church.

SCOTLAND

Edinburgh. S Giles. Parish C; collegiate C 1455–1653; cathedral C from 1661. XIV–XV c; N transept widened 1829.

Elgin. Holy Trinity. Cathedral C. XIII, XIV, XV c; desecrated and injured XVII–XVIII c.

Glasgow. S Mungo. Cathedral C. Largely XIII c; nave end XIII or beginning XIV c; tower XV c.

Kirkwall. Orkney. S Magnus. Cathedral C. Choir now parish C; XII c.

Melrose. S Mary. Cistercian abbey C. 1390–1505; ruined.

Roslyn. S Matthew. Collegiate C. XV c.

SPAIN

Avila. S Salvador. Cathedral C. Chiefly end XII and beginning XIII c; much changed XIV c; cloisters (now ruined) XIV c.

Barcelona. S Eulalia. Cathedral C. Chiefly beginning XIII c; crypt S Eulalia, N transept, cloister, XIV c; done 1448; N W façade 1890; chapels XIII–XVII c.

Burgos. S Maria la Mayor. Cathedral C. Begun 1221; fabric XIII c; upper parts W towers (open spires) XV c; central octagonal lantern XVI c; cloister XIII–XIV c; elaborately decorated chapels XV–XVI c; part W façade remodelled 1790.

Cordova. Virgen de la Asunción from 1238. Former Mesdjid-al-Djàrni 'a (chief mosque). La Mezquita. Cathedral C. VIII c; enlarged IX, X c *sqq.*; chapels XIV c; choir 1523–1607; tower from 1593; vaults 1713; Moorish mosque with Renaissance choir.

Escoriál. Real monasterio de S Lorenzo del Escoriál. A vast church, built 1559–1584; designed by Giambattista; built by Herrara.

Gerona. Cathedral C. Fragments XI c; cloister XII c; choir XIV c; nave without aisles, XV–XVI c; by far the greatest Gothic vault; W front begun 1607, modernized 1733; chapels between internal buttresses.

Granada. S Maria de la Encarnación. Cathedral C. XVI c; W façade (unfinished) 1667; interior done 1703; one of the finest monuments of ecclesiastical Renaissance in Spain.

Leon. S Maria de Regla. Cathedral C. XIII–XIV c; chapels XIV–XV c; W towers XV–XVI c.

—— S Isidoro. Collegiate C. Founded XI c; consecrated XII c; choir XVI c.

Lérida Old cathedral, now used by military. Begun 1203; chiefly XIII c.

Murcia. S Maria. Cathedral C. Founded XIV c; partly modernized, dome XVI c; tower 1522–1766; façade XVIII c.

Oviedo. S Eulalia. Cathedral C. Begun XIV c; consecrated, S W tower done, XVI c; cloister XIV–XV c; Sala Capitular XIII c; Capilla del Rey Casto 1712.

Salamanca. S Maria de la Sede. Old cathedral C. Chiefly XII c; cloister chapels XIV, XV, XVI c; W façade modernized; stately central lantern and dome.

Santiago di Compostella. Cathedral C. XI–XII c; cloister XII, XVI c; exterior modernized XVI–XVII c; some modern chapels; vast transept.

Segovia. Cathedral C. Built 1522–*c* 1577; Capilla Mayor, 1563; apse chapels XVI c; cloister XV c; rich and elaborate vaults.

Seville. S Maria de la Sede. Cathedral C. XV–XVI c; dome rebuilt XVI c; (fell 1888); Capilla Real 1481–1575; Sala Capitular, XVI c; Segrario XVII c; 5 naves, Arab plan; the largest, and in some respects the grandest, Gothic church.

Tarragona. Cathedral C. Chiefly end XII c and first half XIII c; cloister first half XIII c; nave chapels XIV–XVIII c; choir chapels XV–XVIII c.

Toledo. S Maria. Cathedral C. (Catedral Primada.) Begun 1227; continued to end XV c; Santiago Chapel 1435; Capilla Mayor 1498–1504; cloister XIV c; Sala Capitular XVI c; chapels XIII–XVI c; double aisles; gorgeous choir screen.

—— S Juan de los Reyes. Votive C; Franciscan monastery; now parish C. Built 1476 by Ferdinand and Isabella; W portal begun 1553; continued to XVII c; rich C in late style; superb cloister elaborately sculptured.

Church. Fortified Church, Munster Maifeld, Germany.

Tudela. S Maria. Former cathedral C; collegiate C. Begun XII c; chiefly XIII c; secularized 1238.

Valencia. S Maria. Cathedral (popularly La Seo). Founded 1262; S transept façade, exterior apse, middle XIII c; lantern, nave, XV c; Sala Capitular Antigua XIV c.

Zamora. Cathedral C. XII c; additions XV c.

SWEDEN.

Lund. Cathedral C. XI–XII c; German style.

Upsala. Cathedral C. Begun end XIII c by Etienne Bonneuil; continued XIV–XV c; modifications XVIII c; French style.

SWITZERLAND.

Zurich. SS Felix and Regula. Cathedral C. Uncertain date, probably XI and XII c.; cloister c. 1200, marked Italian influences, no W entrance.

TURKEY.

Constantinople. S Sophia (Turkish, Aya Sofia), now mosque. Begun 532; dedicated 537; dome rebuilt, reconsecrated, 566; greatest Byzantine C; built by Justinian; Turkish minarets.

— Barr Ferree.

CHURCH BUILDING. The movement in this direction, which took place in the eleventh and twelfth centuries and culminated in the earlier years of the thirteenth century, is often commented on as almost inexplicable. Wonder is felt at the power shown by small communities in an unsettled land, and in a condition of almost constant local warfare, to produce so many and such elaborate buildings. Not only the great cathedrals which were begun between 1175 and 1220, but thousands of churches of all sizes were undertaken at once all over Western Europe, France taking the lead, England, western Germany, the Low Countries, northern Spain, and northern Italy all following closely the example set. The work had been going on vigorously during the prevalence of the Romanesque style; but the invention of the ribbed vault and the resulting architecture which we call Gothic aided greatly in the movement. The causes of the surprising enthusiasm and long-continued energy of the builders are to be found partly in the desire of the towns to erect monuments of importance which should express their own newly gained chartered privileges; partly in the desire of the bishops to undertake works which should offset and surpass the buildings of the great monasteries; partly, also, in the desire of both the towns and the bishops to rival within the city walls the formidable castles of the nobles in the neighbouring country; partly in the religious zeal and the belief that by contributing to these great structures piety was shown and a claim on heaven established; partly by a common desire for a great place of assembly open to all the people and from which no privileged class could shut them out. That such works were possible, still, however, demands explanation; and this is to be found, it is probable, in the low cost of labour, even of skilled labour, throughout Europe at this time. It has been frequently pointed out that during the earlier Middle Ages, stone, the material, was very expensive in proportion to even the most skilled labour, whereas in modern times the conditions are entirely reversed. Materials were hard to transport, and were, therefore, costly; labour was easy to bring to the spot and very low money wages, accompanied by the necessary food and shelter of the simplest kind, were sufficient to draw the best workmen from all that part of the land to an important undertaking. Forced labour also existed, and voluntary labour such as was furnished for a certain number of days in the year by the willing volunteers on the bishop's initiative; but it is impracticable to say how far this resource was available. Certainly there was not, as under Roman imperial dominion, a great system of *corvées* which could be counted on at all times.

As to the low price of labour applied to buildings, it is to be observed that, even to this day, in lands where masonry has always been a familiar art, and where all buildings are chiefly built of stone and brick with mortar, buildings of great size and of some magnificence are erected by small towns of impoverished provinces or nations, and by individuals whose actual wealth in money is not very great. This was much more generally the case a century ago, or even in the earlier years of the present century. Great palazzi of Italian nobles were still erected during those years, and their gigantic size and ponderous structure are almost as difficult to explain as are the cathedrals of the thirteenth century. A complete examination of the case is impossible here, nor does it appear that the actual comparative cost of such a building as Notre Dame of Paris now and in the thirteenth century has ever been made. Until much careful calculation of this sort has been entered into, the problem of mediæval church building will not be finally solved. — R. S.

CHURCH OF ALL SAINTS. Margaret Street, Cavendish Square, London. One of the earliest and most important of the buildings of the Gothic revival in England, or of what is called Victorian architecture. It was the design of William Butterfield, and was built about 1855. It is celebrated for the free use of coloured decoration produced by the contrast of natural materials with inlay in the stone.

C. OF ARA CŒLI. Properly, S. Maria in Ara Cœli; that is, *at the Altar of Heaven*; in Rome, north of the Campidoglio, and reached by a long flight of steps. Beautiful Renaissance interior resembling an earlier basilica.

C. OF BROU. A flamboyant Gothic church standing in the suburb Brou of the town of Bourg-en-Bresse, in the southeast of France, department of the Ain. It was begun in the fifteenth century, but abandoned; and the work was recommenced at the expense of the Duchess Margaret of Austria in 1506. The most elaborate preparations were made, and ample means were furnished. The building took twenty-five years to complete with all its fittings and the remarkable tombs which it contains; and it is, with perhaps two other buildings, the most important monument of late Gothic style. The church is of considerable, though not of the largest, size; 225 feet long, and about half as wide measured along the transept.

See Havard, *La France Monumentale*, and the very full description in Joanne's guide; also a volume especially devoted to the church, the *Monographie de Notre Dame de Brou*, by L. Dupasquier, Lyons, 1850. The description of the site in Matthew Arnold's admirable poem is entirely unlike the facts. — R. S.

C. OF LA TRINITÉ. Paris; built between 1861–1867 by Albert Ballu, in a style which was a serious attempt at originality based upon the structure. The attempt was made to make the walls high, apparently that the six-story houses near should not dwarf it.

C. OF NOTRE DAME. Paris and elsewhere. (See term Notre Dame.)

C. OF NOTRE DAME DES DOMS. At Avignon; the cathedral. A building containing much work of the very early Romanesque epoch, and having a cupola which is supported on a very curious piece of lintel construction in the roof. The entrance porch is of very early date, and is thought by some to be of Imperial Roman design. The tower is crowned by a modern colossal statue of the Madonna, replacing the ancient pyramidal roof.

C. OF NOTRE DAME DU PORT. Clermont-Ferrand; one of the most important and valuable of the Romanesque churches of France.

C. OF OR SANMICHELE. Florence; in the heart of the city; originally a building used for different civic and business purposes, with an open arcaded story below. These arcades were filled with tracery and closed at a later date, and the building dedicated to S. Michael. It contains the magnificent shrine designed and sculptured by Orcagna.

C. OF S. AGNESE FUORI LE MURA. Outside the walls of Rome; one of the earliest basilicas, and less altered than most of the others.

C. OF S. AMBROGIO. Milan; an early basilica partly rebuilt with twelfth century vaulting, but retaining its original atrium, although with rebuilt ambulatories.

C. OF S. ANASTASIA. Verona; an Italian Gothic church with details of great beauty and interesting painted decoration.

C. OF S. ANDREA. Mantua; the most important church of the early Renaissance; the design of Leon Battista Alberti, and unaltered, although parts of it were completed according to the original design in the sixteenth century, and even later.

C. OF S. APOLLINARE. Ravenna (called S. Apollinare Nuovo, *i.e.* the new, to distinguish it from the one "in Classe"); a basilica famous for magnificent early mosaics.

C. OF S. APOLLINARE IN CLASSE. Ravenna; so called because the sole remaining building of the ancient seaport of Ravenna, Classis, or Portus Classis, the City of the Fleet. A very ancient and little altered basilica.

C. OF S. AUGUSTIN. Paris; an important building designed by V. Baltard, and finished in 1868 in the Romanesque style elaborately modernized.

C. OF S. CARLO BORROMEO. At Vienna; called the Karlskirche. An interesting eighteenth century structure with two decorative columns combined with its front.

C. OF S. CLEMENTE. At Rome; one of the earliest basilicas of the city. The church stands in a part of the city where the surface of the ground has been raised about 16 feet by the accumulation of rubbish from the ruined buildings on the heights above. In consequence of this, an upper church was built upon the walls of the earlier one, which latter was then forgotten, and only explored in the second half of the nineteenth century. The date, even of the upper church, is not perfectly ascertained. It contains an almost unaltered choir enclosure and two ambones (see Ambo), probably of the eleventh century in their present form, though evidently of much earlier date in much of their details.

C. OF S. CLOTHILDE. Paris; a modern Gothic church, begun by the queen of Louis Philippe. It is large, and of an interesting plan, but its style is debased.

C. OF S. COSTANZA. Rome; the tomb of Constantia, or Constantina, the daughter of the Emperor Constantine; a circular building with vaulted aisle, adapted for a church in the thirteenth century, but retaining its original character. Most important in the history of early Christian architecture.

C. OF S. CROCE. Florence; built in the Italian Gothic style, having many chapels with important paintings, and an unexampled number of monuments to important and interesting persons. The Pazzi Chapel, Brunelleschо's first building in the classical style, adjoins the church. The front is of the present century.

C. OF S. DENIS. Near Paris; an abbey church, now a cathedral; commonly known as *la Basilique*. The town of Saint-Denis is five miles north of Paris. The church is partly Romanesque, partly Gothic, and was restored with great care by Viollet-le-Duc.

C. OF S. ÉTIENNE DU MONT. Paris; an interesting church of the Renaissance, with a portal of the reign of Louis XIII., and a very curious jubé.

C. OF S. EUSTACHE. Paris; a church of the earliest French Renaissance, begun in 1532, and the best existing specimen of the attempted addition of semiclassical details to a Gothic structure. The portal is of the reign of Louis XV.

C. OF S. FERMO MAGGIORE. Verona; valuable for the true Gothic feeling of its ex-quaint details; one of the few buildings in Italy in which the Gothic style is used without radical impropriety.

C. OF S. FRONT. Périgueux; once a historical monument of the first importance. Utterly destroyed by restoration. The modern church is still, however, an attractive building.

C. OF S. GENEVIÈVE (called **LE PANTHEON DE PARIS**). At Paris; a monument of the classical reformation undertaken in the reign of Louis XVI.; an original and instructive design; a church without windows, and lighted from the drum of the great cupola, and the occuli in the small cupolas. The design was by Soufflot, but the supports of the great cupola were replaced by Rondelet for the sake of greater strength.

C. OF S. GEORGE, BLOOMSBURY. At London; an eighteenth century building, designed by Nicholas Hawksmoor; famous for its extraordinary spire founded upon the form of an obelisk. The building is otherwise not without merit.

C. OF S. GEORGE, HANOVER SQUARE. At London; eighteenth century; designed by John James. Well known as for many years the place for the celebration of fashionable weddings.

C. OF S. GEREON. Cologne; unique in plan and arrangement, having a long and narrow choir of the eleventh century, and a nave of a singular oblong decagonal shape which replaces the ancient round church. It has also curious Gothic chapels.

C. OF S. GERMAIN DES PRÉS. Paris; valuable Romanesque building.

C. OF S. GERMAIN L'AUXERROIS. Paris; celebrated in history because the parish church to which the inhabitants of the Louvre naturally belong, standing opposite the eastern colonnade of the Louvre.

C. OF S. GERVAIS, S. PROTAIS. Paris; a building of several epochs with an important seventeenth century front. Begun by Louis XIII. (Compare C. of SS. Gervasio e Protasio and C. of S. Trovaso.)

C. OF SS. GERVASIO E PROTASIO. In Venice; known to travellers by the local name S. Trovaso, which see below.

C. OF SS. GIOVANNI E PAOLO. Venice; an important Italian Gothic church, famous for its splendid array of sepulchral monuments, and once for a sacristy which was burned in the middle of the present century.

C. OF S. GIOVANNI IN LATERANO. (See Lateran.)

C. OF S. GUDULE (properly, S. Gudule et S. Michel). At Brussels; the cathedral, an interesting Gothic church.

C. OF S. ISAAC. St. Petersburg; the cathedral; dedicated to S. Isaac the Dalmatian; built between 1819 and 1860 from the designs of the French architect Montferrand. The building has cost a vast sum of money, and is famous for its great solidity and the excellent quality of its material — all granite, marble, and bronze.

C. OF S. LOUIS. Paris; the church connected with the Hôtel des Invalides. Though large and dignified, it is without great importance as a piece of architecture, except in connection with the rotunda and its attendant chapels, forming, altogether, a square building of extraordinary massiveness, and generally called *La Dôme des Invalides.* This was designed by J. Hardouin-Mansart, and built in the reign of Louis XIV. With all its ponderous massiveness it is surmounted by a cupola of wood and lead, without even a stone lantern. In a crypt beneath the circular nave under the cupola is the mausoleum of Napoleon I., visible from above, and accessible by special doorways below; this work was done by Visconti in 1840.

C. OF S. MACLOU. Rouen; a most important monument of the latest French Gothic, and in perfect preservation, the spire only having been added in modern times.

C. OF S. MARIA DEGLI ANGELI. Rome; consisting of the tepidarium of the thermæ of Diocletian. Arranged for a church by Michelangelo, and entirely rearranged by Vanvitelli in the eighteenth century. The most interesting example of a Roman building of the Empire, stripped of much of its original decoration, but still suggesting its intended architectural effect.

C. OF S. MARIA DEL FIORE (S. Maria of the Flower, *i.e.* of the Lily). Florence; the cathedral; formerly called S. Reparata. Giotto's Campanile is its bell tower, and the famous octagonal baptistery with its bronze doors may be considered as an appendage. Brunellesco did his first important work in the cupola of this church.

C. OF S. MARIA DELLA SALUTE. Venice; the church with the white cupola and large, scroll-topped buttresses on the south side of the Canal Grande where it enters the harbour of Venice.

C. OF S. MARIA DELLE GRAZIE (S. Maria of the Graces, or of Grace). Milan, though the dedication is common to other cities. A beautiful church of the Renaissance with a remarkable polygonal tower containing and concealing the cupola within. The refectory holds Leonardo da Vinci's "Last Supper," now almost wholly destroyed by injury and repainting.

C. OF S. MARIA DELL' UMILTÀ. Pistoia; an important design of the Renaissance proper. This simple and grand interior should be compared with the Church of the Madonna di S. Biagio at Montepulciano. The plan is different, but the architectural means employed are similar.

C. OF S. MARIA DEL ORTO. An Italian Gothic church at the northern extremity of Venice.

C. OF S. MARIA GLORIOSA DEI FRARI. Venice; an important Italian Gothic church with many sepulchral monuments.

C. OF S. MARIA IN CARIGNANO. Genoa; built from the designs of Galeazzo Alessio, but with the west front much modified in the eighteenth century, and in a vulgarized form of the rococo style. The church is very large in scale, and is an important specimen of the later neoclassic.

C. OF S. MARIA IN COSMEDIN. One of the earliest of the basilicas of Rome. It retains a splendid Romanesque campanile.

C. OF S. MARIA IN TRASTEVERE. Rome; a Romanesque church of the twelfth century.

C. OF S. MARIA MAGGIORE. Rome; one of the larger of the ancient basilicas, much altered in detail and even in plan. Fine Romanesque tower, which is the earliest remaining part, and eighteenth century façade.

C. OF S. MARIA NOVELLA. Florence; an Italian Gothic church with beautiful front of the earliest Renaissance, by Alberti. It is celebrated for its paintings in the chapels at the east end and for many other works of art; also for its beautiful cloisters, attached to which is the famous Spanish chapel with frescoes of the highest importance.

C. OF S. MARIA SOPRA MINERVA. Rome; the one Italian Gothic interior existing in that city. The name comes from the temple to Minerva, upon whose ruins it was built. It contains Michelangelo's wonderful statue of Christ.

C. OF S. MARK (S. Marco). Venice; originally the chapel of the Ducal Palace; cathedral since the beginning of the present century. A Romanesque building adorned with marbles and with mosaics of many succeeding epochs.

C. OF S. MARTIN. Cologne; called the Great Saint Martin (Gross Sanct Martin); Romanesque twelfth and thirteenth centuries, with a central tower of peculiar beauty.

C. OF S. MARTIN'S IN THE FIELDS. In London, in Trafalgar Square; from the design of James Gibbs, about 1725.

C. OF S. MARY LE BOW. A church built by Sir Christopher Wren in London, in Cheapside, on the site of a much older building which was destroyed in the great fire. Bow Bells are celebrated, and the tower in which they hang, though small and far from lofty, is beautiful in design, and sometimes considered as Wren's masterpiece.

C. OF S. MARY LE STRAND. At London; of the eighteenth century; of merit as an architectural design. The work of James Gibbs.

C. OF S. MARY OF THE CAPITOL (S. Maria im Capitol). Cologne; church of the tenth and thirteenth centuries, preserving the typical Romanesque plan of three apses, on the east, north, and south of the central tower.

C. OF S. MARY OVERIES. Same as S. Saviour, Southwark.

C. OF S. MINIATO. Near Florence; called Samminiato al Monte because crowning a steep hillside outside the walls on the south side of the Arno. An important Romanesque church.

C. OF S. OUEN. Rouen. "The one large church begun and finished (except the lantern) in the fourteenth century in France;" — this epoch having been filled up with the Hundred Years' War, a time of infinite disorder.

C. OF S. PAOLO FUORI LE MURA. Near Rome; entirely rebuilt in the nineteenth century after a fire, but retaining its ancient distribution.

C. OF S. PAUL. At London; the cathedral. The west front is of peculiar beauty and the vaulting of the interior original and fine. The flanks are fine as a composition, but here the second story is a mere screen hiding the aisle roof and clerestory. The cupola is fine in exterior proportion, but is merely a shell of wood and lead built round a cone of brick which carries the stone lantern.

C. OF S. PAUL, S. LOUIS. Paris; a seventeenth century church of great interest, with an elaborate façade on the Rue S. Antoine.

C. OF S. PETER. (See C. of S. Pietro in Vaticano.)

C. OF S. PETRONIO. Bologna; begun in the Italian Gothic on a scale of magnitude exceeding that of any church in Europe; 750 feet long. It should be compared with the first plan for the cathedral at Siena. Only the nave and aisles with their side chapels were ever built, and these alone make a very large church.

C. OF S. PIETRO IN VATICANO. Rome; begun to replace the old basilica of S. Peter's and intended by Pope Julius II. to contain his own tomb which he had ordered Michelangelo to prepare. The long nave now existing was never proposed until the seventeenth century, as Michelangelo left the plans it was still a Greek cross, and the dome which he designed, though others built it after his death, would then have been as effective from the front as it now is from the Vatican gardens. In spite of adverse criticism the church remains one of the most valuable and instructive in Europe.

C. OF S. REPARATA. (See Arnolfo.)

C. OF S. ROCH. Paris; a church begun in the seventeenth century and having a west interesting and vigorous interior; the façade is of the eighteenth century; on the Rue St. Honoré.

C. OF S. SAVIOUR, SOUTHWARK. At London, on the Surrey side. Retains much of its original Gothic structure.

C. OF S. SOPHIA (called also Aya Sophia; Hagia Sophia). Constantinople; the most important monument of the Byzantine style, and, so far as its interior is concerned, probably the most beautiful church in Europe.

C. OF S. SULPICE. Paris; begun in the reign of Louis XV. and finished by Servandoni half a century later. It is as large as a first-rate cathedral and has a very interesting neo-classic west front with an upper and lower colonnade.

C. OF S. TROVASO. In Venice; the name being a popular abbreviation of SS. Gervasio e Protasio, a cinquecento building of interest with important paintings and a beautiful altar and pulpit.

C. OF S. WULFRAN. In Abbeville (Somme); one of the most important of the late Gothic buildings of France, containing in itself an almost complete exposition of the florid style, although never completed according to its original plan.

C. OF THE BADIA. (See Badia.)

C. OF THE FRARI. (See Church of S. Maria Gloriosa.)

CHURCH OF THE HOLY SEPULCHRE. At Jerusalem; built under the Latin kingdom of Jerusalem which was founded by the Crusaders in 1099. Even if the work of the Latins amounted only to the rebuilding, it seems to have been complete, as the building is Occidental in character with Byzantine modifications. The general plan, including a circular structure carrying a cupola which is assumed to cover the actual sepulchre of Christ, has served as a plan for churches in different parts of Europe. Such a church exists at Cambridge, England, and one at Neuvy-Saint-Sépulcre (Indre). It is common to speak of these buildings as churches of the Holy Sepulchre, that being accepted as a name for the peculiar plan.

C. OF THE INVALIDES. At Paris. (See Church of S. Louis.)

C. OF THE LATERAN, or of S. John Lateran. (See Lateran.)

C. OF THE MADELEINE. Paris; begun in the reign of Louis XV. and continued according to a quite different design by the orders of Napoleon I.; but not completed until 1832. It is a Roman temple in exterior design, and of enormous size, more than 350 feet long, octostyle with twenty-five columns on either flank. The interior is arranged to resemble a great hall of Roman antiquity with three cupolas supported on pendentives which spring from columns standing clear of the great piers; the decoration is extremely rich.

C. OF THE MADONNA DI S. BIAGIO. Montepulciano, in Tuscany; by Antonio di Sangallo, a remarkable design of simplicity and rational building carried to an extreme. The church should be compared with that of the Madonna del Calcinajo, by the same artist, on the hillside near Cortona.

C. OF THE MADONNA DELLA CONSOLAZIONE. Todi, Umbria; a cruciform church, the four arms being rounded like apses and covered with half domes, while a cupola on a high drum covers the centre; one of the finest buildings of the true Renaissance.

C. OF THE MADONNA DEI MIRACOLI. At Brescia; a Renaissance church with a singularly beautiful façade, hardly suggesting a church, but full of the most delicate detail.

C. OF THE MADONNA DEI MIRACOLI. Venice; a beautiful church of the early Renaissance; completely restored about 1865, but still retaining its general effect and the semi-Byzantine character which makes it, with a few other Venetian buildings, representative of a special variety of Italian Renaissance.

C. OF THE MIRACOLI. (See C. of the Madonna Dei Miracoli.)

C. OF THE NATIVITY. Bethlehem, Palestine; a basilica with many dependent buildings and large cloister, etc. The church is thought to have been built during the reign of Constantine, and the tradition is that it occupies the site of the building in which Christ was born. There is no doubt that much of the church is of the time of Constantine.

C. (properly **CHAPEL**) **OF THE SORBONNE.** Paris; built in the seventeenth century at the expense of Cardinal Richelieu and containing his tomb. It has an interesting cupola which is considered as the first successful one in Paris.

C. OF THE SUPERGA. On a hill three miles from Turin; built in the eighteenth century by the King Vittore Amadeo and intended as a votive church and burial place for the royal family. The church proper is closely combined with the buildings of the convent which carry two towers, these forming an interesting group with a large central cupola. This cupola springs from eight free columns, behind which are eight great piers dividing chapels.

C. OF THE THEOTOKOS. In Constantinople; an important late Byzantine church.

C. OF THE VAL-DE-GRÂCE. Paris; built by Louis XIV. and finished in 1665; at first an abbey church, the whole foundation being an offering from Anne of Austria, mother of the king. It has a beautiful cupola, but not of masonry.

C. OF VAUX. In the suburbs of Laon in northern France; with a beautiful early Renaissance nave and a somewhat later choir and central tower, early flying buttresses and wheel window; an important piece of architecture.

C. OF ZANIPOLO. Same as C. of SS. Giovanni e Paolo; the popular Venetian abbreviation.

CHURRIGUERA, DON JOSEF; sculptor and architect; d. 1725.

A native of Salamanca (Spain), he went to Madrid in 1688. At Madrid he designed the great catafalque for the obsequies of the Queen Maria Louisa (d. 1689), built the new portal of the church of S. Gayetano, a palace for Don Juan de Goyeneche, and executed various pieces of sculpture for altars of churches and convents. He was succeeded by his sons Gerónimo and Nicolas. The term Churrigueresque is applied to the extravagant style which he affected.

Stirling-Maxwell, *Annals of the Artists of Spain*; Bermudez, *Diccionario*.

CHURRIGUERESQUE ARCHITECTURE. In Spain, the more elaborate work of the latter part of the seventeenth and of the eighteenth centuries; so called from Churriguera (Don Josef) of Salamanca and his two sons, Gerónimo and Nicolas, to whom is generally attributed the initiative toward the extravagances and eccentricities of the style, especially in church architecture. The style is characterized by a disregard of the canons of classic design and the combination of its features, or members, or fragments of them, in the most incongruous and grotesque assemblages conceivable. Stucco and gilding were lavishly used, and broken pediments, twisted shafts, and contorted scrolls abound. High altarpieces, fantastic doorways, and picturesque towers are also characteristic. The result is, like nearly all Spanish work, highly decorative, and not without a certain theatrical splendour, but lacks the essentials of propriety, refinement, and structural reasonableness. About 1750 a more academic style, due to Italian masters, began to displace the Churrigueresque. Written also Churrigueresco. (See Spain.)

CHUTE. An inclined or vertical trough or shaft, for conveying materials of any kind to a lower level, as coal from the sidewalk into a cellar, or grain from an elevator into a vessel, or rubbish from the upper floors of a building, in process of alteration, to the ground, or ashes from a fireplace to a receptacle in the cellar. A *mail chute* is a patented device for conveying letters from the different floors of a building to a letter box near the street. The term has been extended to mean an inclined plane or slide for the amusement of coasting in toboggans, or rollers, or in flat boats which slide into a pool, river, or other water at its base.

The words *chute* and *shoot* are often confounded; *shoot* is more commonly used in Great Britain. — A. D. F. H.

CIACCHERI. (See Manetti, Antonio Ciaccheri.)

CIBBER, CAIUS GABRIEL; sculptor; b. 1630 (at Flensburg, Holstein); d. 1700.

Caius Cibber was the son of a cabinet maker employed by the king of Denmark. He studied sculpture in Rome, and went to England just before the Restoration. He was employed by Sir Christopher Wren (see Wren) and John Stone, and assisted in the decoration of Hampton Court, Chatsworth, the Royal Exchange, and other important buildings. He was the father of Colley Cibber, actor and dramatist.

Walpole, *Anecdotes of Painting*; Redgrave, *Dictionary of Artists*.

CIBORIO. In modern Italian churches, a closed receptacle for the safe keeping of the consecrated wafer, differing from the monstrance in that it is closed solidly. The term is evidently the Latin ciborium modified, and its significance is, perhaps, nearer to the original meaning than the definition given under that term. There are two common forms of the ciborio: one is a cupboard, like an ambry, but usually close to the altar, and having commonly a richly adorned door and door frame, often of marble sculptured in relief; the other is a vase-shaped hollow termination to a substructure, as in the baptistery or chapel of S. Giovanni at Siena, in Tuscany, where the large vase with its supporting clustered pillar rises out of the centre of the font. This meaning is closely connected with the familiar one of a portable covered vessel serving the same purpose. (In this sense, written only as above, but see Ciborium, Cibory, Civery, Severy.) — R. S.

CIBORIUM (pl. Ciboria). A fixed canopy over a Christian altar, supported either on columns or cross beams, and resembling an inverted cup, hence its name. The ciborium came into use, as an accessory to an altar, as soon as the Christians began to build churches having any architectural value, and it is still in use, both in Eastern and Western Christendom.

Ciboria are made of wood or metal or alabaster, or of other lasting materials or combinations of two or more of the same. That of S. Sophia at Constantinople (A.D. 534) was an octagonal pyramidal dome of silver, resting upon four silver columns and crowned with a cup, formed of acanthus leaves, holding a globe surmounted with a cross, and the whole enriched with damascening. This ciborium was further enriched with hangings of cloth of silver shot with gold and embroidered with coloured silks, representations of Christ, the Virgin Mother, S. Peter, and S. Paul, together with a multitude of beautiful ornamental designs.

Where there is a ciborium within a ciborium, a dome over a dome, as in the church of S. Paul Fuori le Mura at Rome, the smaller one is called a peristerium. The columns support-it sometimes rests on the footpace and sometimes on the retable of the altar.

The most celebrated ciboria are those of the high altar of S. Peter at Rome, of S. Mark at Venice, of S. Ambrose at Milan, of S. Niccolò at Bari, of S. Apollinare at Ravenna, and of S. Paul the Apostle at New York.

(For the different extensions of meaning which this word has received, see Ciborio and Severy.)

Ch. Rohault de Fleury, *La Messe*, Paris, 1883; A. Barbier de Montault, *Construction de l'Ameublement*, Paris, 1880. — Caryl Coleman.

CIBORY. Same as Ciborium.

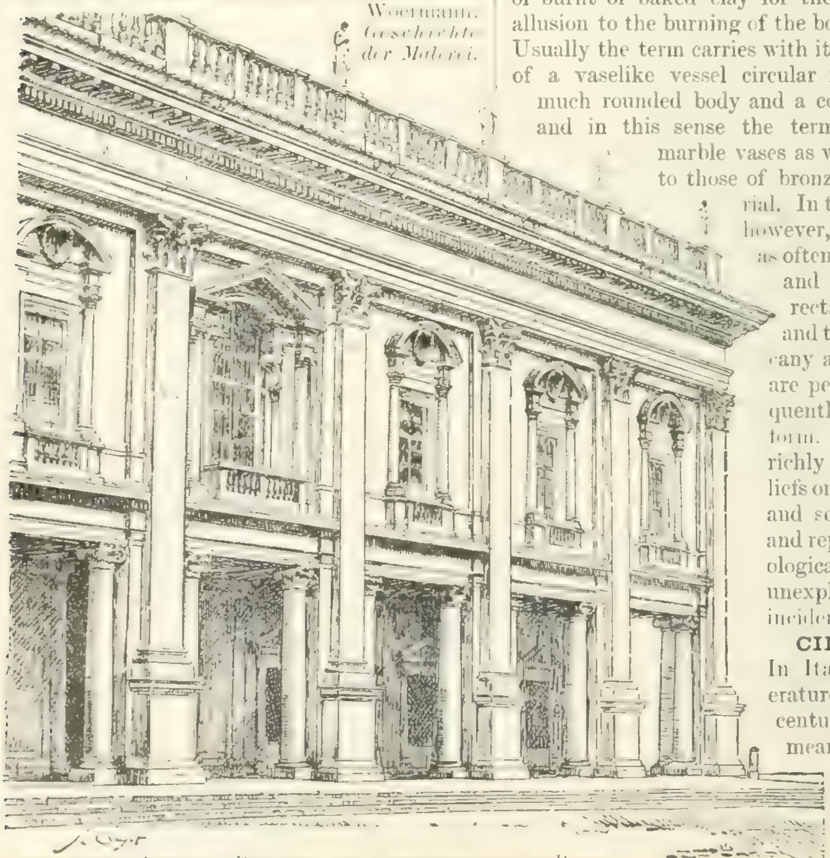
CIEL. (The French word meaning heaven or sky; hence a canopy, etc.) The tester of a bed; especially the under side of such a tester considered as a surface for decoration.

CIGOLI. (See Cardi, Luigi.)

CIMABUE, GIOVANNI; painter; b. 1240; d. about 1302.

Of the early Florentine painters Cimabue was the first to emancipate himself from the formalities of Byzantine painting. He was the principal painter employed in the decoration of the "upper church" at Assisi (Karl Frey, op. cit.) in which work his pupil Giotto (see Giotto) was associated with him.

Karl Frey, *Studien zu Giotto*; Woltmann and Woermann, *Geschichte der Malerei.*



Cinquecento Design. Palazzo dei Conservatori at Rome, Closing Years of 16th Century.

CIMBORIO. In Spanish architecture, that cupola or lantern which rises from the roof immediately above the high altar, or the choir, or in the immediate neighbourhood of that sacred part of the church. By extension, any tower usually low and broad, rising above the roofs of a church as at the Crossing.

CIMELIARCH. A room in, or attached to, a church for the keeping of the *cimelia* or valuables, such as vestments and jewels; the treasury of a church. (Originally, the custodian of the *cimelia*.)

CINCTURE. The ring or annular fillet at the top or bottom of the shaft of a column of classic type, forming the lower member of the astragal or the upper member of the base; ordinarily it is understood to refer to the latter.

CINERARIUM. A receptacle or depository for sepulchral urns containing the ashes of incinerated bodies; particularly, in ancient Roman pagan and early Christian tombs, a place provided with niches for that purpose.

CINERARY URN. Properly, a receptacle for the ashes of a corpse which has been incinerated. The term is connected with the Latin verb meaning to burn to ashes; and is connected either with the original use of vessels of burnt or baked clay for the purpose, or by allusion to the burning of the bodies of the dead. Usually the term carries with it the signification of a vaselike vessel circular in plan, with a much rounded body and a cover and a foot; and in this sense the term is applied to marble vases as well, and perhaps to those of bronze or other material. In the stricter sense, however, antique urns are as often square or oblong and approximately rectangular in shape, and those even in Tuscany and central Italy are perhaps more frequently of this general form. Some of them are richly adorned with reliefs once richly painted and sometimes gilded, and representing mythological and sometimes unexplained scenes and incidents. — R. S.

CINQUECENTO. In Italian art and literature, the sixteenth century. The term means five hundred or the five hundred, and applies to those years from 1501 to 1599.

CINQUEFOIL. (See Foil.)

CIONE, ANDREA DI. (See Orcagna.)

CIONE, BENCI DI. (See Benci di Cione.)

CIONI ANDREA DI. (See Verrocchio.)

CIPOLLINO. Same as Cipollino Marble, under Marble.

CIPPUS. In ancient Roman and Greek art, a short stone column or pillar, set up as a landmark, or in commemoration of some event or person, or as a tablet for public notices; a stele. The term is Roman, but is often used of Greek as well as of Etruscan and Roman pillars.

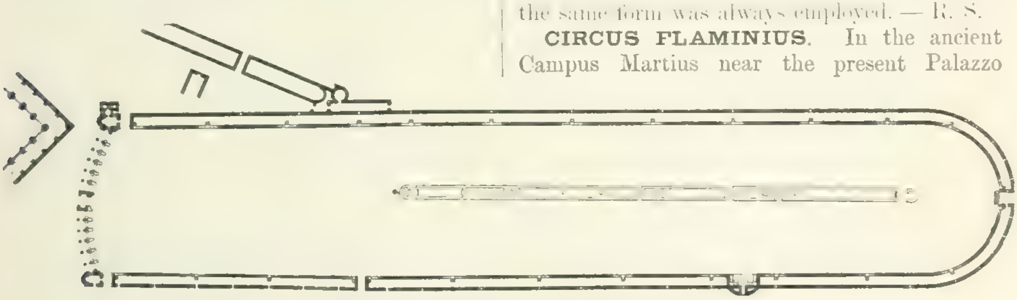
CIPRÉS, PEDRO; architect.

According to a document of the cathedral of Gerona (Spain) Ciprés succeeded in 1840 the French architect Vautier as director of the works of that cathedral.

Viñaza, *Adiciones al Diccionario historico.*

CIRCUIT BREAKER, ELECTRIC. (See Electrical Appliances.)

CIRCUS. In Roman archæology, an open place surrounded by seats for spectators, and used for chariot races, and sometimes for other games. The earliest in the city of Rome was that which was called afterward the Circus Maximus, which gradually grew up in the low valley south of the Palatine Hill. The building was continually altered and added to, and after Julius Cæsar had rebuilt it, in whole or in part, it was reputed to hold 150,000 people. The seats, being still commonly of wood, were often consumed by fire, and Trajan seems to have finally completed it in marble, increasing its general effect of splendour. Other such buildings are mentioned below.



CIRCUS OF MAXENTIUS, NEAR ROME, ITALY.

The essential peculiarity of the circus was that its plan allowed chariots to pass along one side, keeping the seats of the spectators on their right; and on their left a long raised mound, or wall, called the spina. Turning at the upper end, and keeping the spina still on their left, the chariots returned nearly to the point where they had started. In order to facilitate the starting of all the chariots equally, the *carceres*, in which they stood until the signal was given, were arranged in a curve, not on the axis of the circus, but with its centre at a fixed point on the axis of the track or passage which they would occupy at the beginning of the race. That is to say, every chariot had an equal chance of arriving first at the meeting point in the middle of this track, and thus each had an equal opportunity of choosing the preferred part of the broad road. (See Carcer.) The spina also was set, not parallel to the rows of seats, but slightly diverging, so that the track in which the chariots started was wider at the beginning than toward the turning point; this evidently, because the chariots on starting would be all together in a cluster, which would thin out as the race proceeded, the chariots reaching the upper end of the course in sequence rather than all together. The spina was adorned with various structures and movable objects intended partly for decoration, partly to keep the order of the races. Statues, trophies of arms, and even rather important architectural structures were built upon the spina, and it was terminated at each end by structures called the *metæ*, each of the two being crowned by tall obelisks or slender cones; though it does not appear that the same form was always employed. — R. S.

CIRCUS FLAMINIUS. In the ancient Campus Martius near the present Palazzo Mattei. The remains lie under buildings of considerable importance, and have not been studied.

CIRCUS MAXIMUS. (See above.) Very little of the structure remains; partly because the low walls and the location in the mediæval city allowed of constant quarrying in its ruins. The substructures, however, have been partly uncovered and studied.

CIRCUS OF CALIGULA AND NERO. At the foot of the Vatican Hill, nearly where now stands the sacristy of S. Peter's church.

CIRCUS OF MAXENTIUS. On the Appian Way, two miles from Rome; it is in better preservation than any of those in the city. Its splendid decorative marbles have disappeared, but the external wall of masonry remains largely intact, and the vaults which supported the seats, though often ruined, are traceable; also, the wall above the carceres can be made out almost completely, as well as the spina. It is mainly from this circus that our knowledge of the plan and apparent uses of all these structures have been derived.

CISSING. In painting, a preparatory operation for graining wood.

CIST. Commonly a movable case, box, or chest, especially applied to objects of classical antiquity. By extension, same as Cistvaen.

CISTERCIAN ARCHITECTURE. (See Monastic Architecture.)

CISTERN. A structure or compartment for the reception and storage of water; built of brick or stone, or of wooden staves; one differently built being usually called a Tank. Cisterns are built underground of a round shape, except those of unusually large sizes, which are made square or rectangular. The size of a cistern is determined by the amount of rain water to be stored, and depends also on the area of the roof and the rainfall. To prevent contamination, cisterns are built perfectly watertight, and the inside, when of masonry, is plastered with Portland cement. The overflow pipe from a cistern must never connect with a house or street sewer, and is best carried into an open ditch or road gutter, the outfall being protected by a flapvalve, grating, or bar strainer. The top of such a cistern is arched over and covered with iron or stone cover, and the surface graded away from same. Cisterns should be well ventilated, to prevent the water from becoming stagnant. (For the cisterns used in plumbing, see Tank; Water-closet. See also Vera da Pozzo.) — W. P. GERHARD.

Supply Cistern. A reservoir or cistern from which the water service of a house is wholly or partly drawn; it is generally excavated in the earth, lined with brick, stone, or cement, domed over at the top, and generally furnished with a chain pump, for aerating purposes. (Called also Supply Tank.)

CISTVAEN. A Celtic sepulchral chamber of flat stones set together like a box, and covered by a tumulus.

CITADEL. The strongest part of a fortress; especially in the case of a fortified city, that part of the works which is peculiarly strong, and is capable of separate defence, even after the city has been taken.

CITY. A town of size and importance — the distinction between it and other towns differing widely in different countries and times.

A. In England, generally a town which contains a cathedral church, and is therefore the seat of a bishop and the centre of a bishopric. The name is often retained even when the bishopric is abolished or changed.

B. In the United States, a town which has been incorporated by act of the legislature of a state, and which has a mayor and other officers forming a specially recognized government — most commonly a legislative assembly of one or two houses. The term is open to misunderstanding — thus, according to the definition, Washington, the federal capital of the United States, is not a city, being governed directly by the federal authorities, and administered by a commission. It used to be said in the middle of the present century that the state of Vermont had only one city, and that one only a village, Vergennes. — R. S.

CITY HALL. The chief public building of a city — that in which the mayor's office, and generally the chambers of the legislative body, are located, together with offices for other officers, and perhaps some court rooms for city courts. That of New York City is peculiarly interesting to Americans as being one of the earliest buildings of architectural character and considerable pretensions erected in the United States, and exceptionally good. It is admired by critics of all the schools. (See United States, Architecture of, Part II. Compare Broletto; Hôtel de Ville.)

CIVERY. *A.* Same as Ciborium.

B. A compartment in a vaulted roof or in a canopy.— (A. P. S.)

CIVITALI (or **CIVITALE**), **MATTEO**; sculptor and architect; b. 1436; d. 1501.

Matteo was born at Lucca, Italy, but was probably trained in Florence, in the atelier of Antonio Rossellino (see Gambarelli, A.). One of his early works is the statue of S. Sebastiano, in the cathedral of Lucca. His most important undertaking is the monument to Pietro da Noceto, in the cathedral of Lucca (about 1470), which resembles the monument of Leonardo Bruni, by Bernardo Rossellino (see Gambarelli, B.). About 1473 he made a retable for Domenico Bertini, of which two figures remain in the cathedral of Lucca. In this building he also made the balustrade of the chancel, the octagonal shrine called *Volto Santo*, and the altar of S. Regulus. The Palazzo Pretorio at Lucca is ascribed to him.

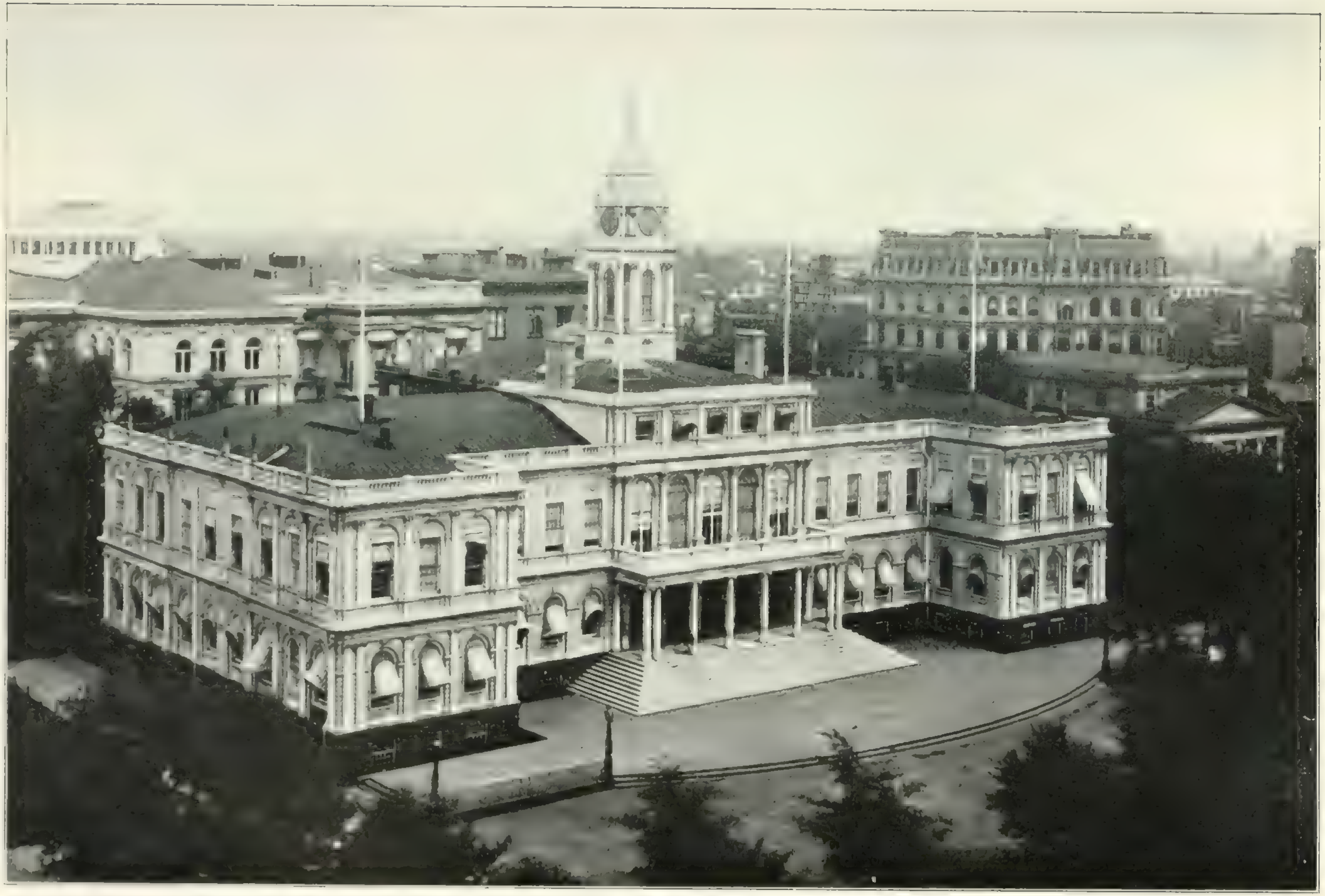
Yriarte, *Matteo Civitale*; Muntz, *Renaissance*; Perkins, *Tuscan Sculptors*.

CIVORY. Same as Ciborium.

CLAMP. A piece or instrument for securing or holding, generally distinguished from other devices used for that purpose as being applied to the surface of the parts, and not passing through the material, although perhaps entering a short distance. It may be a member to unite two or more parts of a structure permanently together, as a cleat or strap; or a tool to hold temporarily one or more pieces of material in process of being prepared or finished, as a carpenter's screw clamp.

CLAPBOARD. *A.* A board for the outside covering of the walls of a wooden building, intended to be applied horizontally, each board overlapping the one below. Clapboards are usually 6 to 8 inches wide, about $\frac{5}{8}$ of an inch thick at the lower edge, diminishing nearly to a feather edge at the top. They are made of clear pine, cedar, or cypress, and are laid with about 4 or $4\frac{1}{2}$ inches to the weather. An attempt has been made to limit the term

PLATE XIX



CITY HALL

That of New York; built for the original and smaller city confined to the southern part of Manhattan Island. It was built before 1812; the architect was John McComb, who has received great credit from the later and more curious generations of students for the quiet and graceful design. There is within an admirable double stone staircase, circular in plan and filling a very well designed rotunda with galleries of communication above.

specifically to a particular kind of such boards made in New England. These are made in lengths of 4 feet by cuts radiating from the centre of the log, so that each board is quarter-sawed, and hence superior to those as usually worked. According to this distinction, all other such boards would be merely bevelled siding.

B. In English usage, one of a certain variety of imported oak boards for wainscotting. The term formerly signified an unfinished stave or shook. — D. N. B. S.

CLAPEROS, ANTONIO; sculptor.

A sculptor of Barcelona (Spain), who worked on the cathedral of that city after 1440. In 1449 he executed certain work for the cloister of that church, and, in 1458, statues of the twelve apostles for the façade of the cathedral of Gerona.

Viñaza, *Adiciones al Diccionario historico.*

CLARKE, GEORGE, D. C. L.; amateur architect; b. 1660; d. 1736.

Dr. Clarke was educated at Oxford, and was, as Walpole says, "classically conversant" with architecture. He assisted Nicholas Hawksmoor (see Hawksmoor, N.) in designing the towers of the quadrangle of All Souls' College, and himself designed the library of Christ Church College. He was associated with Henry Aldrich (see Aldrich), and shared with him the honour of having designed three sides of Peckwater Square (Christ Church), and the gate of the church of All Saints, in the High Street. All these buildings are in Oxford. In the large collection of books and manuscripts which he left to Worcester College was a copy of Palladio, with Italian manuscript notes and drawings by Inigo Jones (see Jones, I.).

Walpole, *Anecdotes of Painting*; Redgrave, *Dictionary of Artists*; Ackerman, *History of Oxford.*

CLASSIC ARCHITECTURE. That of the Greeks and Romans, and hence, that of a style derived directly from the Greco-Roman.

The word classic is applied to art and literature with two different meanings. The narrower and more pregnant meaning includes the allied arts and allied literatures of the Greeks and Romans, and is really equivalent to Greco-Roman. The doctrine which grew up with the Renaissance, that these arts and literatures monopolized all excellence in their kinds, led to the vaguer and more popular use of the word to imply an excellence which secures permanent recognition and is independent of the changes of fashion. It is often used, by analogy, to indicate qualities which are the special praise of Greek and Roman work — stateliness, elegance, and the careful coördination of all the parts of a composition. In this sense the word is chiefly applied to literature, yet it evidently has had a real, though undefined, influence in architecture and the other arts by perpetuating the impression that whatever is classic in the stricter sense of Greek or Roman is so in the looser sense — that is, is of standard excellence. This impression has doubtless helped to stimulate various quasi classic revivals that have appeared in architecture during the last three centuries, and has encouraged a common feeling that any application of classic forms is good enough, without concern for the artistic purposes that are embodied in them, or the limitations which belong to them. (See Neoclassic; Pseudo-classic.) In this work the word classic will be used in its stricter sense, denoting the architecture of Greece and Rome and their colonies or provinces. — W. P. P. LONGFELLOW.

CLASSICISMO. In Italian art, the formal style of the sixteenth century, resulting from the *Risorgimento*, *Rinascimento*, or Renaissance, and passing gradually into the Decadenza. The term denotes a supposed reference to all the principles and details of the art to purely Greco-Roman models.

CLAUS (NICHOLAS) DE WERVE; sculptor and architect.

A nephew of Claus Sluter (see Sluter, C.). He is first mentioned in 1398, when he took charge of the construction of the monument of Philippe le Hardi during the illness of Claus Sluter. He executed nearly all the sculpture of this work. This monument was broken up during the Revolution, but has been restored, and is now in the Museum at Dijon, Côte d'Or, France. The latter part of his life was spent in great poverty and distress. The design of the monument of Jean Sans Peur, also at the Museum of Dijon, has been ascribed to him (see Jean de la Huerta).

Lami, *Dictionnaire des Sculpteurs français*; Chabeut, *Dijon*; Gonse, *L'Art Gothique.*

CLAUX SLUTER. (See Sluter, Claus.)

CLAYTON, JOSEPH; architect.

Clayton published *The Churches of London and Westminster built by Sir Christopher Wren* (1 vol., folio, 1848–1849), and *A Collection of Ancient Timber Edifices of England* (1 vol., folio, 1846).

Redgrave, *Dictionary of Artists.*

CLAY WALLING. A primitive method of wall construction in regions abounding in clay, as in Mesopotamia, in some parts of Great Britain, and of the Southwestern states of the United States. The wall is sometimes formed of compacted or stamped clay in the mass (pisé), sometimes and more often, of unburned bricks dried in the sun, called in the United States and Spanish America adobe. (See Mesopotamia.) In some cases the clay wall is backed at least in part by trees of fagots built against it. (Compare Vitrified Work.)

CLEAR (n.). Unobstructed space; opening considered as between the inside limits of two opposite parts. Chiefly used in the adjectival phrase, in the clear — *i.e.* taken or measured at the narrowest part of an opening; in general, the shortest or perpendicular distance so taken. (Compare Over all; Out to out.)

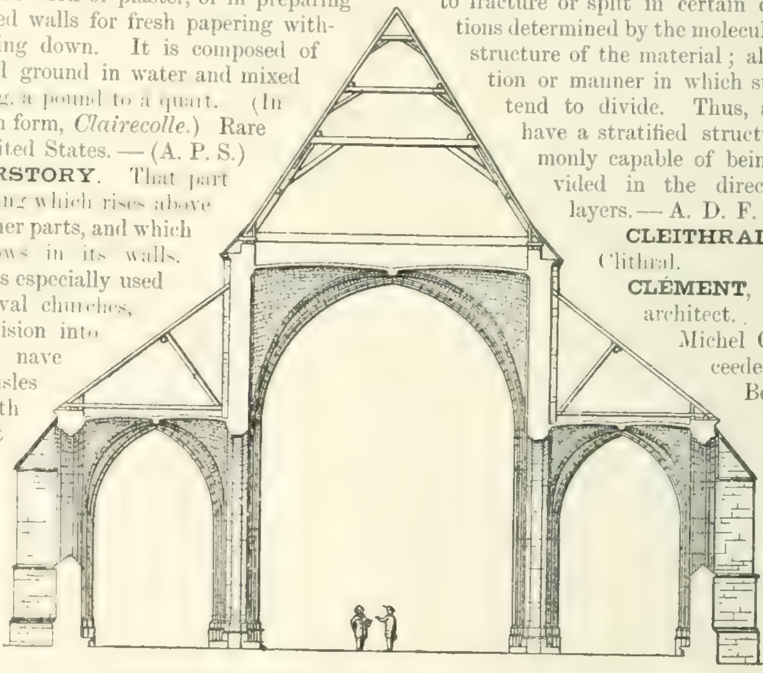
CLEAR (adj.). *A.* Open, free of obstruction. See Clear (n.).

B. Clean, without impurities or defects; without admixture. Thus, clear cement is cement unmixed with sand or lime.

C. In connection with lumber, free from knots, shakes, sap, and the like.

CLEARCOLE. In Great Britain a species of sizing or priming used as an undercoat in painting old work or plaster, or in preparing old papered walls for fresh papering without scraping down. It is composed of white lead ground in water and mixed with sizing, a pound to a quart. (In the French form, *Clairecolle.*) Rare in the United States. — (A. P. S.)

CLEARSTORY. That part of a building which rises above roofs of other parts, and which has windows in its walls. The term is especially used for mediæval churches, whose division into a central nave and side aisles of less width and height made the opening up of the wider central nave a natural and obvious arrangement. It dates back, therefore, at least as far as the earliest Christian basilicas. A similar arrangement is, however, traceable in some buildings of Roman antiquity. The term, if used for such buildings, is used with a sense of extending the application of it beyond its usual meaning. (Cuts, cols. 613, 614.) — R. S.



CLEARSTORY, FIG. 1. CHURCH OF VILVORDE, BELGIUM.

What should have been the clearstory is covered by aisle roof (see Fig. 2).

CLEAT. *A.* A strip of wood nailed, screwed, or otherwise fastened across a number of boards to hold them together or to stiffen or otherwise strengthen them; or secured to a wall or other upright as a support for a shelf, or the like.

The cleat differs from the Batten generally in being smaller and in having only the significance of a piece used to secure together planks or boards laid edge to edge, or of stiffening a very wide piece of plank or board. The common term Batten Door would be better described as cleat door, for the transverse piece is short and need not be heavy; it may be thought, however, that the battens referred to in this term are the longitudinal or principal pieces. (Compare Batten in sense *A.* For the term as used in electric wiring, see under Electrical Appliances.)

B. A device for temporarily attaching a cord, — as of an awning; usually of metal and consisting of a shank or short leg from which two arms extend in opposite directions. The cleat being secured in place by the shank, the cord may be wound about the arms.

CLEAVAGE. The natural tendency of certain materials, especially of stones and crystals, to fracture or split in certain definite directions determined by the molecular or physical structure of the material; also, the direction or manner in which such materials tend to divide. Thus, stones which have a stratified structure are commonly capable of being readily divided in the direction of the layers. — A. D. F. H.

CLEITHRAL. Same as Clithral.

CLÉMENT, MICHEL; architect.

Michel Clément succeeded Colin de Berneval (see Berneval, C. de) as maitre de l'œuvre of the church of S. Ouen at Rouen about 1440.

Quicherat, *Construction de S. Ouen à Rouen.*

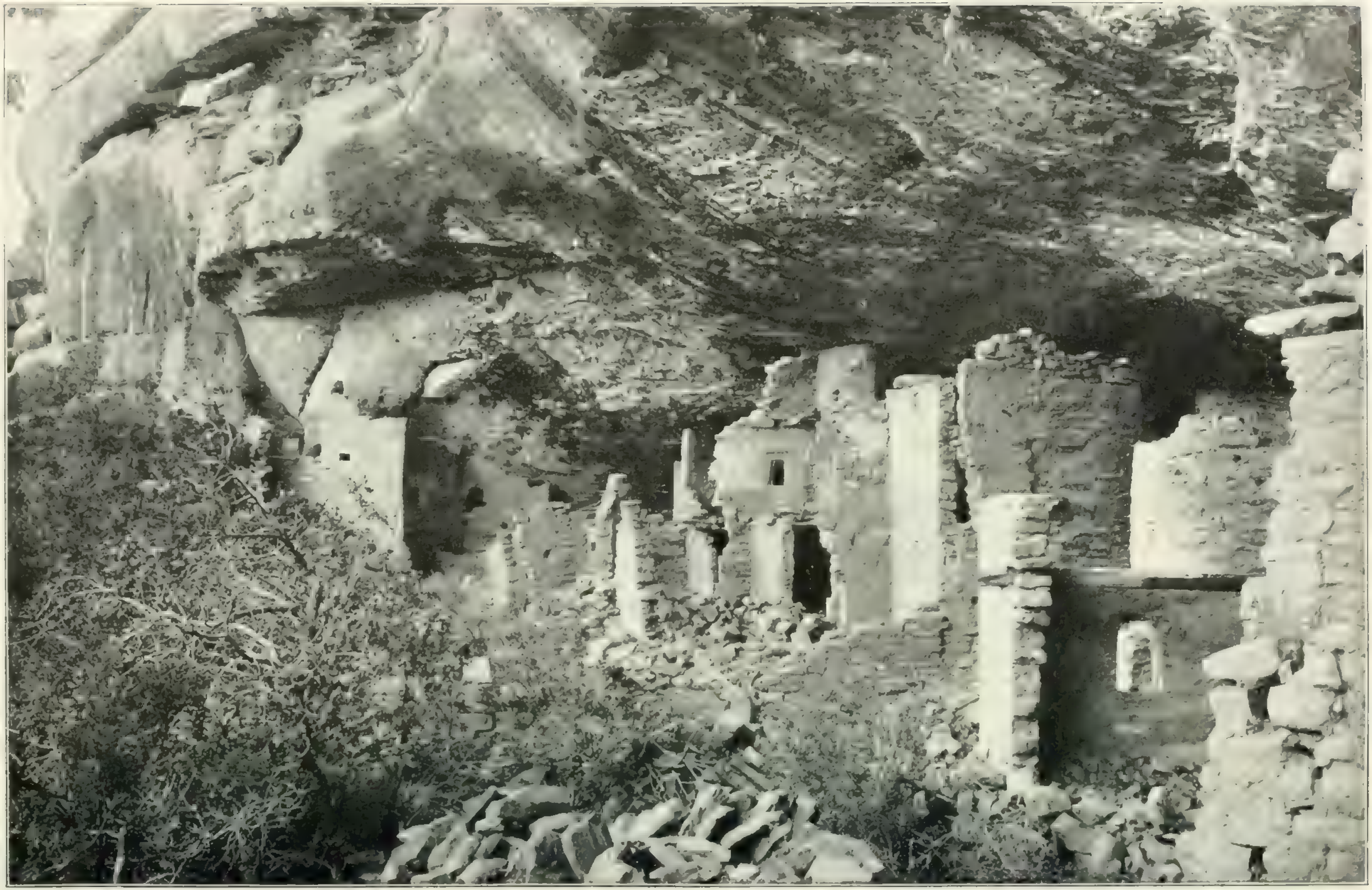
CLEOMENES (KLEOMENES); architect and engineer.

Cleomenes is mentioned by various authors as the builder of the city of Alexandria (Egypt).

Brunn, *Geschichte der Griechischen Künstler.*

CLEOPATRA'S NEEDLE. An obelisk which, having been brought originally from upper Egypt for the decoration of Alexandria, stood near the beach until 1879, when it was brought to New York City. It now stands in Central Park. The companion obelisk, which had lain for centuries on the sand, was removed to London in 1877; and, since that time, the two are sometimes called the two Cleopatra's Needles; but the term had been applied for many

PLATE XX



CLIFF DWELLING

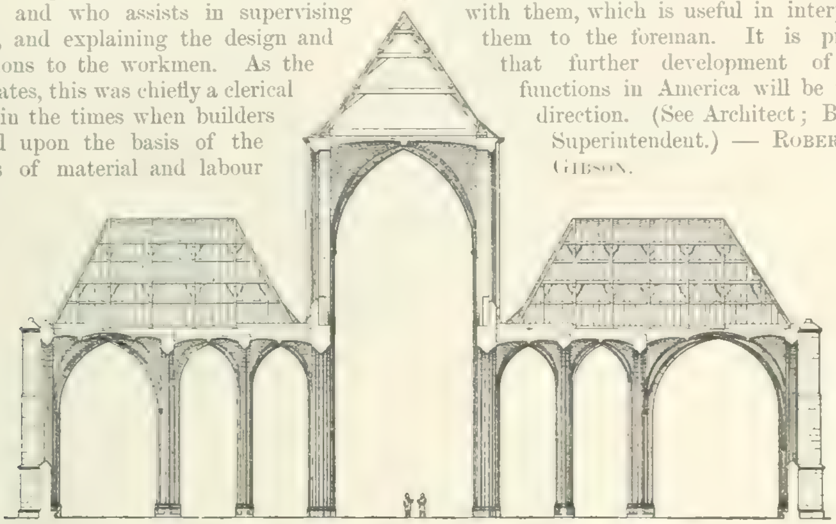
That called the Spruce Tree House, in Mancos Cañon, Colorado. This group of rooms, or buildings, stands on a shelf in a natural alcove of the cliff, which has been but slightly altered by man. The walls are built up of slabs and blocks of stratified stone, selected, as in all cliff dwellings, from the cliff-talus debris, rudely broken to shape and laid in adobe mortar.

years to the standing one only. Each of the obelisks is about 70 feet high, without the pedestal.

Egyptian Obelisks, by Lieutenant Commander Henry H. Gorringe, U.S.N., the officer who brought the obelisk to New York.

CLERESTORY. Same as Clearstory.

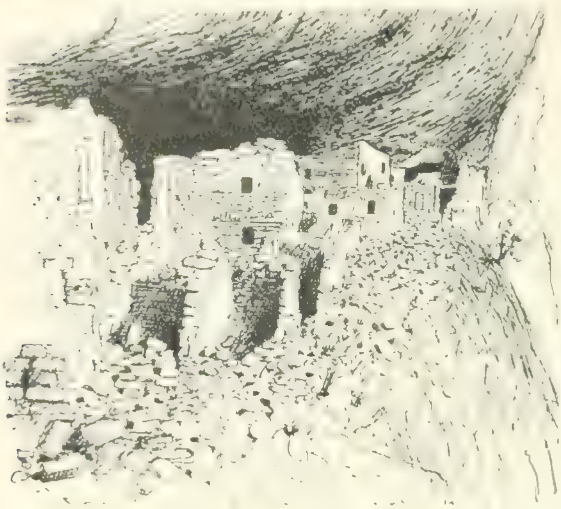
CLERK OF WORKS. A person who keeps records, on the spot, of the materials used and labour expended upon a building or other structure, and who assists in supervising the work, and explaining the design and specifications to the workmen. As the title indicates, this was chiefly a clerical function, in the times when builders were paid upon the basis of the quantities of material and labour supplied, by "day's work" as it was called. At the present time, when the amount of compensation is usually agreed upon in advance, the clerk of works has comparatively little of recording work, and more of supervising. He is usually an assistant to the architect with a practical, rather than theoretical, training, whose duty it is to be constantly watchful of the quality and correctness of the work, according to the contract; but who has nothing to do with design, or original orders. His whole time is spent at one edifice and his presence fills the intervals between the architect's visits and continues his authority. The clerk of works is usually paid by the owner, but selected by the architect and responsible to him. His employment is an established custom in England upon works of any importance, and in that country are to be found qualified men, with distinct methods and customs and traditions. In the United States the growth of architectural practice has produced the necessity, in an indefinite way, without any corresponding supply of trained skill. The term Clerk of Works when used here is applied to a representative of the architect; different from the usual superintendent, in that he is always on the works, and has no duties elsewhere, and is properly paid by the owner as for extra service. But he is rarely a practical man, generally in fact he is less so than the superintendent, and has less initial authority, being not a deputy or substitute for the architect (as the superintendent is) but only a junior representative. In this capacity, however, he performs valuable duties and some of the office routine is conveniently done in the temporary office; and having usually worked upon the original drawings, he has full familiarity with them, which is useful in interpreting them to the foreman. It is probable that further development of these functions in America will be in this direction. (See Architect; Builder; Superintendent.) — ROBERT W. GIBSON.



CLEARSTORY, FIG. 2. CATHEDRAL OF ANTWERP, BELGIUM.

The aisles covered by a roof hipped so as to leave open the clearstory.

CLIFF DWELLING. An American Indian house built in a cliff, either in a cavelike opening, a gallery, or on a ledge. Especially applied to structures in the cliffs of the Southwestern United States and Northern Mexico, built by Indians similar to the present Pueblos. Stone slabs and adobe mortar were the materials commonly used and the architecture was of the usual Pueblo style. Some of the small buildings were temporary abodes occupied during the growing season of crops planted in near-by fertile valleys or cañon bottoms; others were storehouses or granaries, while others, particularly the large groups, were permanently occupied. In some of the huge conchoidal recesses common to certain sandstone formations, whole villages were built, numerous ruins of which remain. In other formations, where there was a soft series of strata between harder ones, the softer, disintegrated by nature, or, probably, sometimes partly dug out by the Indians, formed a gallery with a flat floor and a flat, or almost flat, ceiling, 8 or 10 feet high. The front of a gallery like this would be closed by walls of masonry, excepting openings for windows or doors, and perhaps a space at the top, left for a smoke outlet. Entrance was had at one end, or if possible at other points. The galleries were divided by transverse walls. Where the overhead stratum was too high or too shelving to form a natural roof, one was constructed in the usual Pueblo manner. Cliff houses were often near a village, or other houses, built on bottom lands, and in some instances were part of such village or houses. The motive for cliff building was frequently defence, but the desire for a comfortable, secluded abode, contiguous to farming lands, was also an important factor. It was to some extent an adaptation to environment. Sometimes a community had a village in a valley and another in a mountainous, defensible place, whither they fled in times of danger. In his narrative of Coronado's expedition of 1540, Castañeda says: "The whole nation left two very fine villages, which they had on either side of the river, entirely vacant, and went into the mountains, where they had four very strong villages in a rough country where it was impossible for horses to go." Some of the best examples of cliff ruins are in Cañon de Chelly, Arizona, and in Mancos Cañon, Colorado. Cliff dwellings were not all occupied at one time, some groups being vacant while others were fully inhabited. Some were occupied after the Spanish conquest of New Mexico. The Moki of to-day are practically cliff dwellers, though they occupy the summits of cliffs. (See Cavate Lodge, under Lodge; Communal Dwelling; Mesa Dwelling.) — F. S. D.



Cliff Dwellings: a Ruined Village.

CLIFF OUTLOOK. A form of Cliff Dwelling; a little house, or small group of houses, built by American Indians of the Pueblo type in a recess of a cliff, for a shelter while tending crops. — F. S. D.

CLIMAX. In Greek architecture, the radiating passages with steps in an ancient theatre leading from the orchestra to the various tiers of seats. (See Theatre.)

CLINCH (n.). That which clinches; a clinched fastening; the turned-over point of a clinched nail.

CLINCH (v.). To bend over and hammer down the protruding point of a nail so that it cannot be withdrawn; to secure or fasten a nailed structure by so doing.

CLINCHER. A wrought-iron nail used in clinching, having usually a broad head. (Called also clinching nail and clinch nail.)

CLITHRAL. Roofed over, as distinguished from hypæthral, especially in the discussion of Greek and Greco-Roman temples.

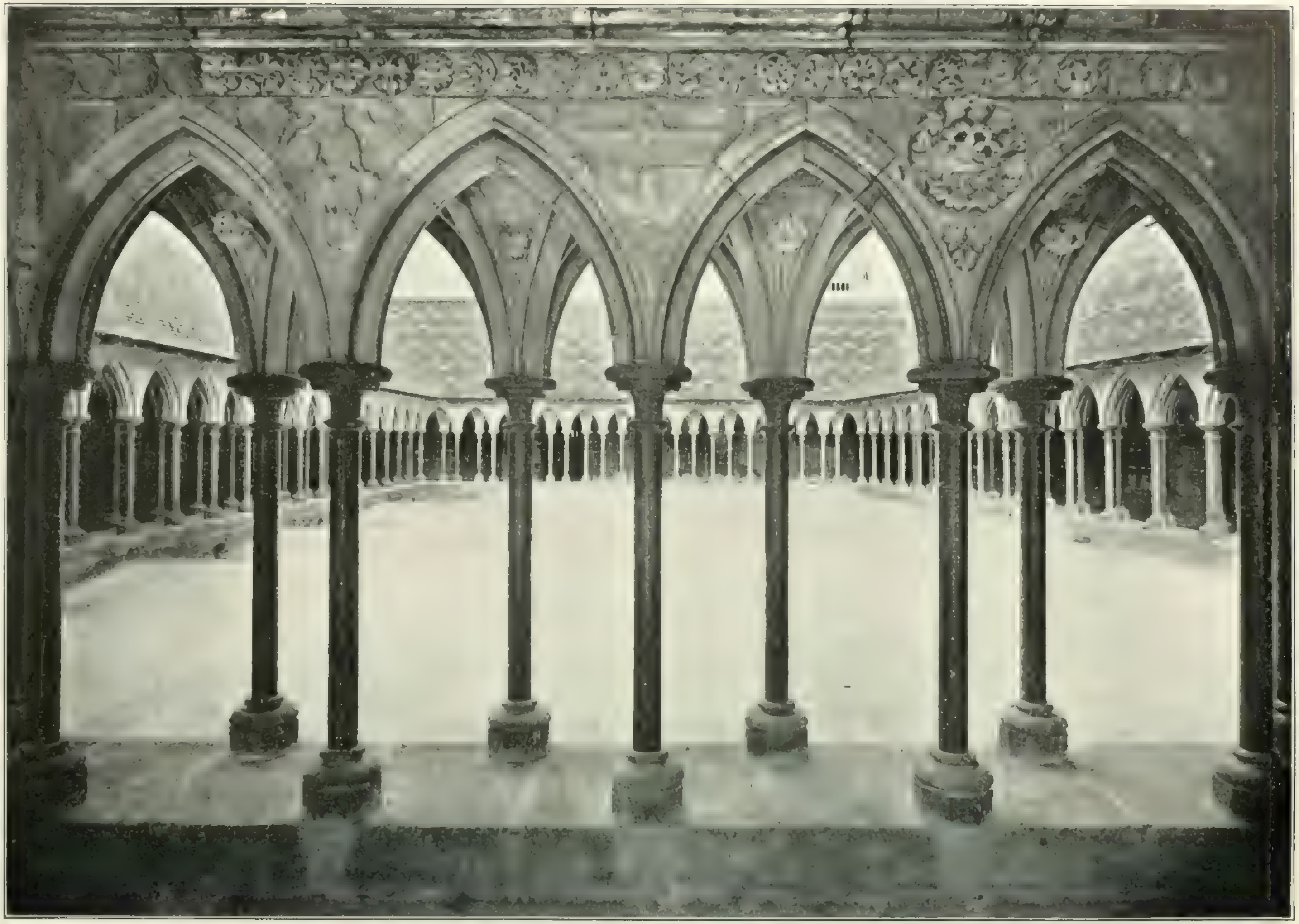
CLOACA. In Roman archæology, a sewer. The Cloaca Maxima, or greatest sewer, was built in the early days of the city of Rome in order to drain the forum and the neighbouring low grounds. It is a remarkable piece of Etruscan work vaulted in stone in three rings of voussoirs.

CLOAKROOM. A room for the deposit and care of overcoats, hats, etc., as: *A.* In a theatre, lecture hall, or similar place of resort, a room where the property of persons attending the performance can be cared for.

B. In a private house, a room for hanging up out-of-door garments when not in use. In this sense, a toilet room, water-closet, etc., are often contained in the cloakroom, or in a separate enclosure adjoining, and the one term covers them all. (Compare Coatroom.)

CLOCHAN. A kind of prehistoric stone building of which many more or less ruined examples are found in Ireland, especially the southern and western counties. They are mostly of small size, some square or rectangular, some oval or round, generally of a domical or beehive shape in elevation, of rude and heavy masonry laid up without cement. Some of them have been occupied as cells by hermit monks, but

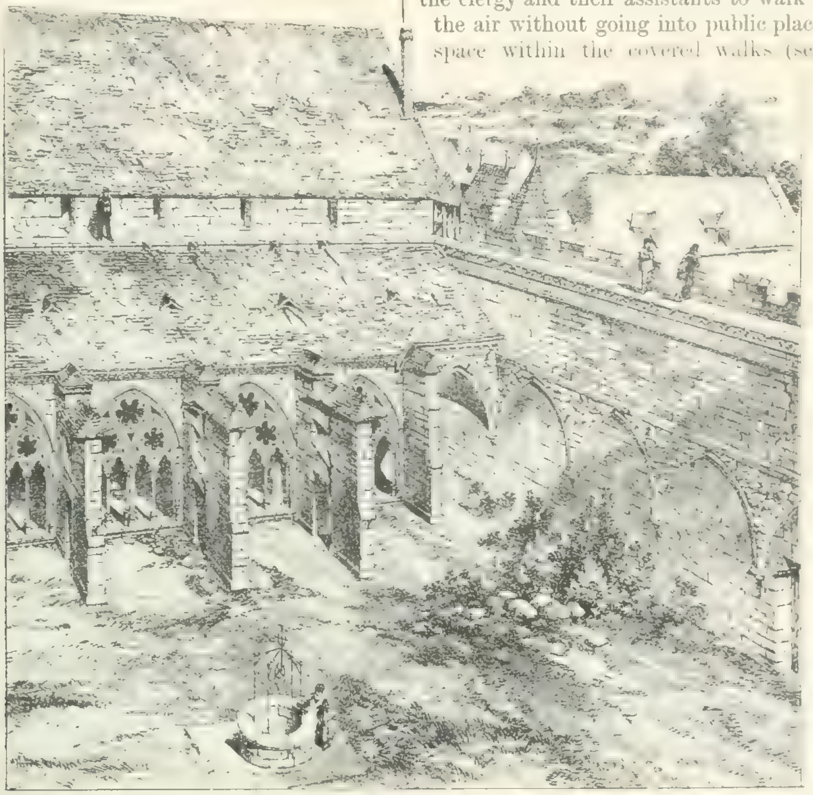
Cliff Dwelling Ruin.



CLOISTER

That of Mont S. Michel, on the coast of Normandy; unique in that the space enclosed by the ambulatory is not a garth or patch of grass and garden beds, but the roof of the *Salle des Chevaliers*, which itself is raised above a lower story. This curious disposition comes from the piling up of the buildings upon a naturally steep and lofty rock. The alternating arches of the screen carry a curious piece of vaulting in the thickness of the wall. All of this work is of the finest time of Gothic architecture, about 1230.

they were built in pagan times, and their purpose is a subject of speculation.



Cloister: Cathedral of Noyon (Oise): View of East Side of Chapter House and Part of Cloister.

CLOCK TOWER. A tower whose chief object is, or appears to be, the containing of a large clock, usually in a prominent and easily seen position. The term is generally applied to the one tower, of many, which holds a clock, as the clock tower of the Palais de Justice at Paris, or a tower having a clock of remarkable character, like the *Torre del Orologio* at Venice.

CLOCK TURRET. A small tower or turret bearing on one or more of its faces a clock; distinguished from a clock tower by its subordinate character with reference to the rest of the building, or by its smaller dimensions. It usually stands upon or rises out of the roof, and is consequently in most cases a framed structure. A well-known example is that on the Hôtel de Ville at Paris; the City Hall at New York has one built about 1814, and they are common on public buildings, especially town halls.

CLODION. (See Michel, Claude.)

CLOGHAN. Same as Clochan.

CLOISTER. A court surrounded by ambulatories which, in a convent or the like, or in connection with a cathedral or any ecclesiastical structure having subordinate buildings, is used as a means of communication, as a reserved space for affording light to the windows of a church or the like, and as affording a place for the clergy and their assistants to walk and take the air without going into public places. The space within the covered walks (see Alure; Ambulatory) is called the Garth or Cloister Garth; it is sometimes used as a garden, sometimes merely as a grass space; and sometimes a fountain for ornament, or the supply of water is located within it.

Cloisters of the Gothic age are still numerous in Europe, and are often very beautiful; the opportunity afforded by the vaulting of the ambulatory and by the arcading along the garth having been used to produce beautiful effects of combined sculpture and architectural design.

Cloister: Carmine Convent, Brescia.

Some few instances of still earlier treatment exist, as in the famous Romanesque cloister of S. Trophime at Arles. After the Gothic epoch fewer cloisters were built, apparently because of the number already existing, but some interesting neoclassic examples are to be found in Italy, Germany, and especially in France, as in the great monastery, now ruined, of Villeneuve-lez-Avignon. Ambulatories are generally only one story high in whatever style they are carried out; but, in connection with the cathedral at Verona, there is one two stories high, and at Monte Oliveto Maggiore, near Asciano, in Tuscany, the great cloister, famous for its fresco paintings, has ambulatories in three superimposed stories. At Assisi, in Umbria, a change of level between the two sides of the cloister is met by a two-storied ambulatory. At Mont S. Michel, on the coast of Normandy, the great cloister is built upon the roof of a vaulted chamber below; this because the whole group of structures, church and convent, with refectories and lodgings, is piled high upon the top and sides of a steep and almost inaccessible rocky hill.

In a long-established ecclesiastical or monastic institution, the cloister becomes the particular recreation ground and place of meeting for the inmates, the clergy of high rank appropriating to themselves one side of the ambulatory, or the whole, at certain hours of the day. The buildings of occupancy frequently took their light from the open space, and one sees a little apparatus of wires or cords by means of which the occupant of a third-story room will draw water in a small pail from the fountain or well in the middle of the garth without having to leave his window. Lavatories, and sometimes large fountains for the monks to wash before going to meals, are sometimes provided under cover in rooms, or in widenings or extensions of the ambulatory. It is usual to have the garth accessible from the ambulatory only in one, two, or four points by means of a gap in the dwarf wall which carries the columns of the arcade. This evidently to save the gardens or the patch of grass from too constant and unnecessary invasion. — R. S.

CLOISTERED ARCH. Same as Cloistered Vault. (See Vault.)

CLOISTER GARTH; CLOISTER GREEN. (See Cloister.)

CLOIT, CHRISTIAN; bell founder.

In 1448, with the assistance of Heinrich Brodermann, Cloit cast the great bell called Pretiosa of Cologne cathedral, one of the finest in existence. The name of the bell, the date of its casting, and the names of the makers are inscribed upon it.

Allgemeine deutsche Biographie.

CLOSE. (Sometimes pronounced to rhyme with dose.) The plot of ground occupied by a cathedral and its dependent buildings, and formerly always enclosed by a wall. The closes of some English cathedrals are extensive, and contain fine trees of great age; the buildings also, being grouped in a picturesque fashion, give a parklike character to the whole.

CLOSER. The last stone or brick laid in a course, or part of course, fitted to the opening so as to complete the row. In brickwork, the closer may be a whole brick or less. Queen closer is less than half a brick; king closer more than half a brick; brick or brickbat, any portion of a brick having one unbroken end.

CLOSET. *A.* Originally, a private room; the sitting room or chamber of a person of some distinction.

B. In modern usage, a place for storage, distinguished from a cupboard only as being larger, perhaps large enough for a person to enter. By extension, the term covers such a small room when fitted with conveniences for washing, and the like, as a wash closet, a dressing closet.

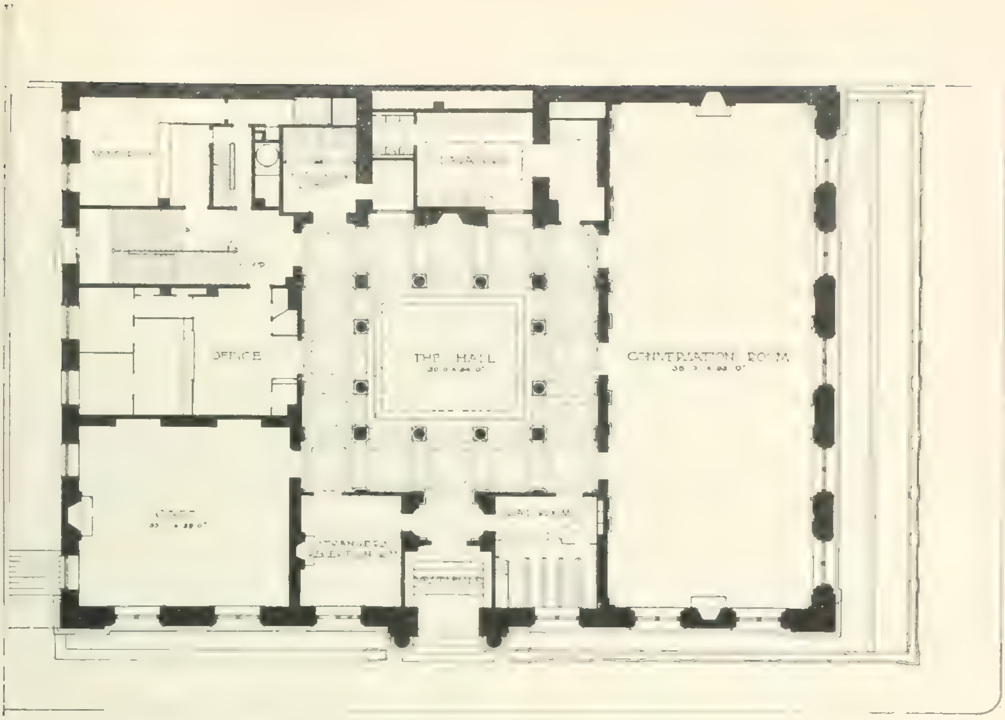
Plate Closet. In Great Britain, a closet or small room connected with the butler's offices for the custody of plate. When the plate is of much value, such a closet is commonly made fireproof and is called a plate room or plate safe (Kerr). In the United States, usually a much less pretentious compartment called silver closet, silver safe.

Silver Closet. (See Plate Closet.)

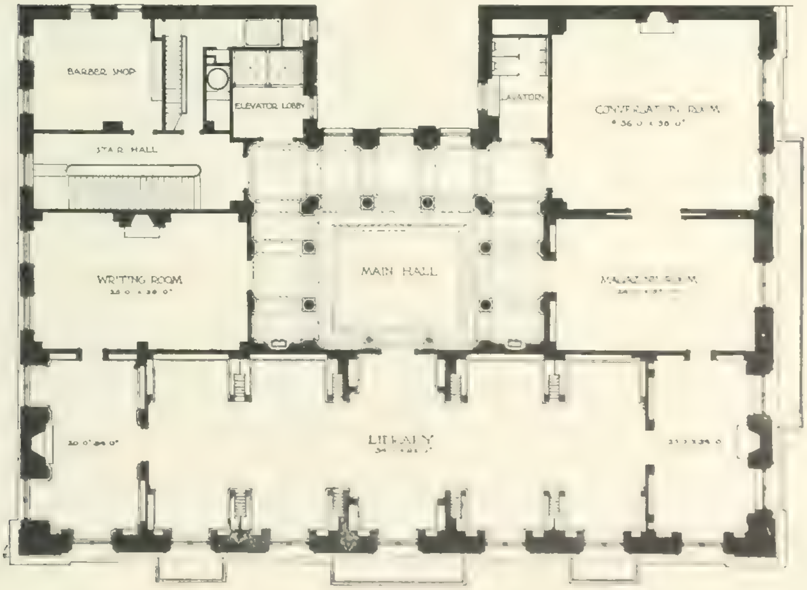
CLOSURE. A wall, balustrade, or arcade serving as a screen; but where standing at the edge of a roof, gallery, or the like, serving as a parapet. The term is especially used for a short length of such wall, etc., which is set between two columns, having usually no connection with the columns, but standing free.

CLOTHES DRYER. A frame on which to hang clothes and the like for drying; an apparatus consisting of such a frame in an enclosure, together with appliances to supply artificial heat. (See Laundry.)

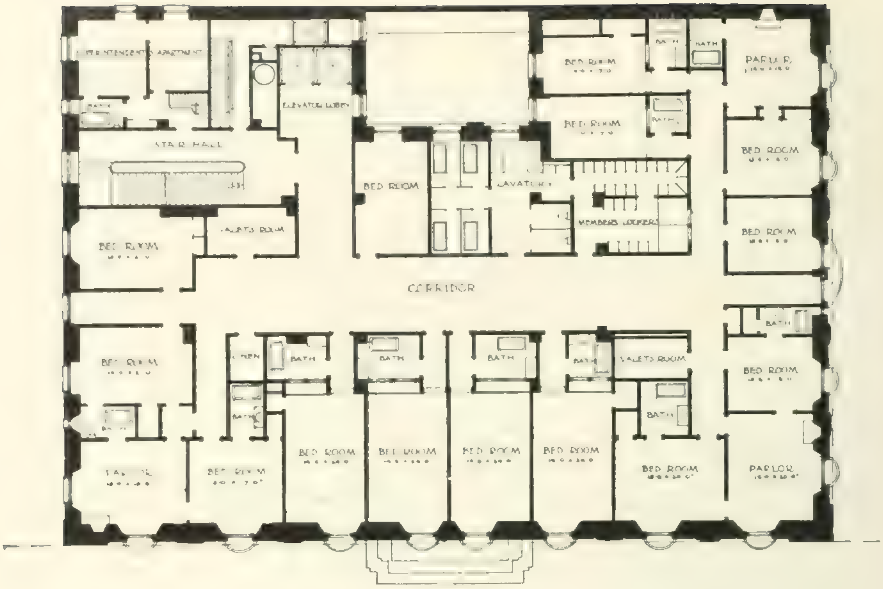
CLUB HOUSE. A building occupied by a club. The main requirements of such a house are usually those of social intercourse, as reading rooms, conversation rooms, dining rooms, etc., with usually some arrangements for a library, and the necessary offices for the clerks and steward, or superintendent, as well as for the house servants. Some clubs having a special purpose, as political, literary, or artistic, require to be provided also with picture galleries, with large rooms for gatherings, or for libraries of unusual size. The most important clubs and the most costly and elegant houses have been generally those of London. They stand on Pall Mall, St. James Street, Piccadilly, and neighbouring streets, and are sometimes very stately mansions. Club houses have recently



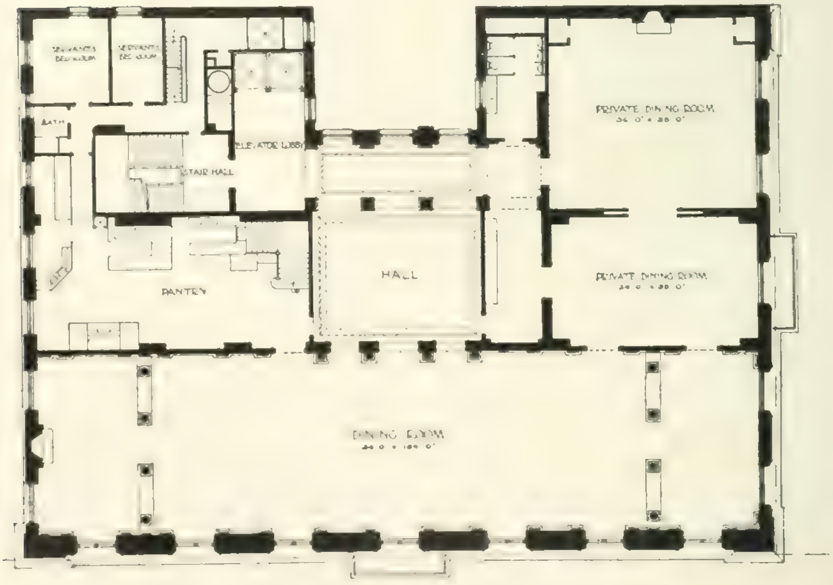
Club House: University Club, New York; Ground Floor



Club House: University Club, New York; Second Principal Floor



Club House: University Club, New York; One of the Two Mezzanines.



Club House: University Club, New York; Third Principal Floor.

been built in American cities vying with those of London in importance. — R. S.

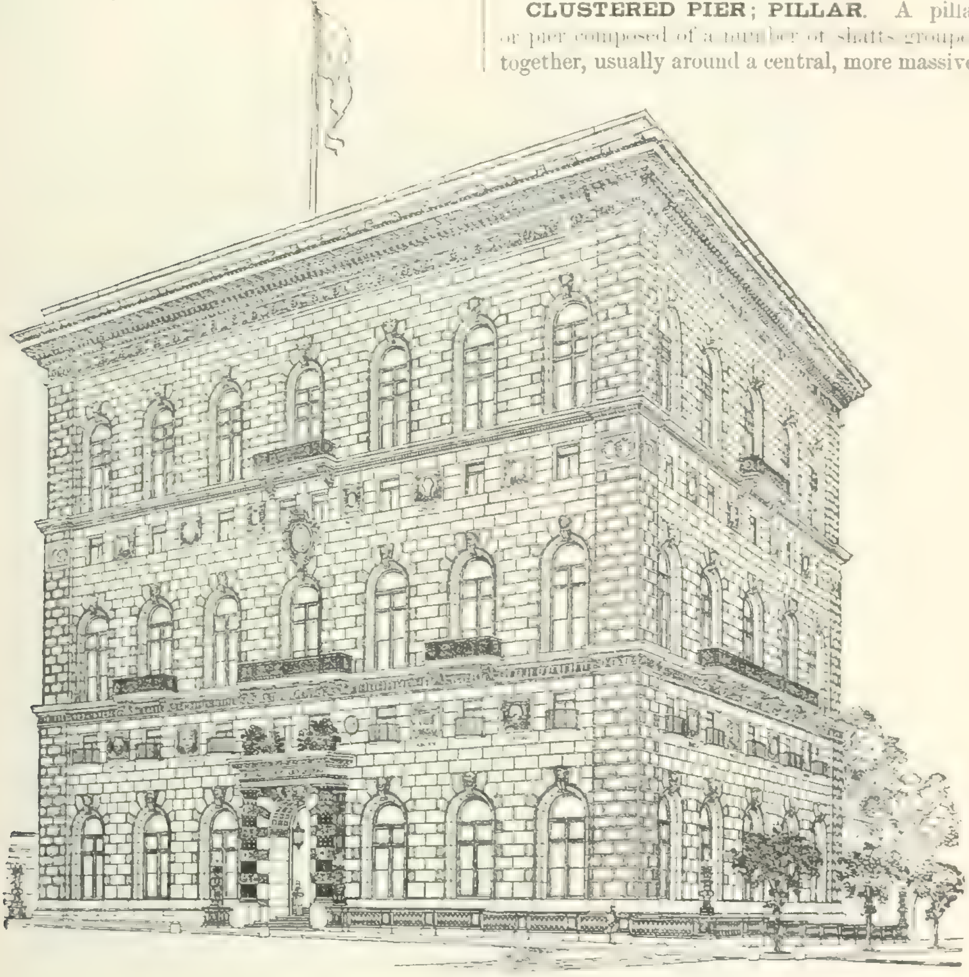
CLUNCH. In local British usage, a stiff clay or chalk, used in primitive building.

CLUNIAC. Pertaining to the monastic order of Cluny. (See Cluniac Architecture; Monastic A.)

CLUNIAC ARCHITECTURE. That of the style developed by the Cluniac monks, and especially that of the great abbey of Cluny in the French department of Saône-et-Loire. The Cluniac architecture and sculpture has to do especially with this abbey and with its immediate effect upon buildings erected in its neighbourhood. The abbey church of Cluny, finished in the earlier years of the twelfth century, is thought to have been the most splendid Romanesque building in France. It has now entirely disappeared. It is claimed for the Cluniac monks that they were the most scientific builders of the Romanesque epoch, and that their study of geometry led directly to the building of the proto-Gothic buildings of the east and northeast of France, especially the church of S. Denis. It is also claimed for them that they established a school of sculpture of singular intelligence and artistic feeling. (See Romanesque Architecture.)

CLUNY, HOTEL OF. (See Hôtel de Cluny.)

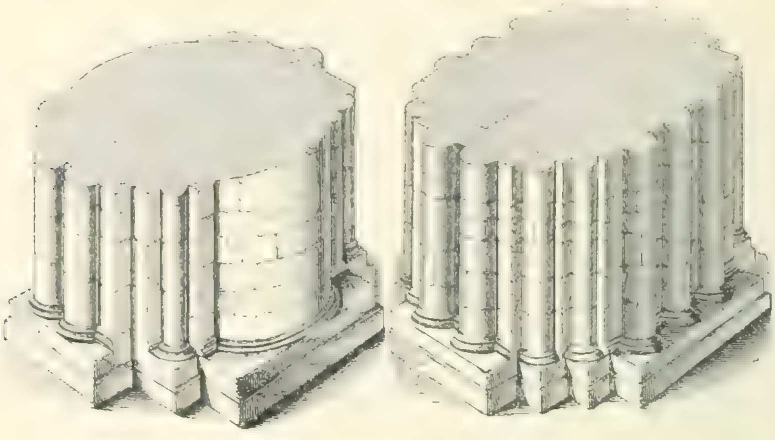
CLUSTERED PIER; PILLAR. A pillar or pier composed of a number of shafts grouped together, usually around a central, more massive, shaft or core, as in the piers separating the aisles of mediæval churches. This clustering of shafts, which became general after 1200 in Western Europe, seems to have grown out of the use of boltels at the angles of the early Norman and Romanesque square piers. Except in England, the minor shafts (each of which usually corresponds to a particular vaulting rib or pier arch moulding) were almost always engaged in the central mass, but in Great Britain they were frequently in the early English period detached, tied together at intervals by moulded bands forming bond stones, and made of dark Purbeck marble to contrast with the lighter stone of the masonry.



Club House, University Club, New York. (See Plans.)

The clustered papyrus-stalk or lotus columns of Egyptian tombs and temples are, properly speaking, not pillars, but columns of quatrefoil or similar plan. (See Column; Gothic Architecture; Pier.) (Cut, col. 629.) — A. D. F. H.

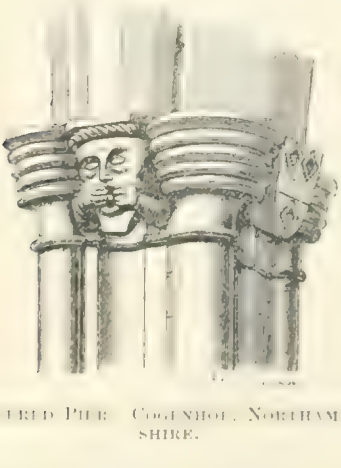
COACH HOUSE. Same as Carriage House.



Clustered Piers: Norwich Cathedral, c. 1100.

COAMING. A frame around an opening in a floor or roof, rising above the surrounding level to prevent the flow of water into the opening. Especially when around a scuttle.

COARSE STUFF. In England, the first or rough coat of plaster applied to the masonry or laths. It is composed of lime, sand, and cow's or goat's hair in proportions varying according to the quality of the lime or local practice. In the United States, generally called Scratch or Scratched Coat. (See Plaster; Plastering.)



Clustered Pier: Cogenhoe, Northamptonshire.

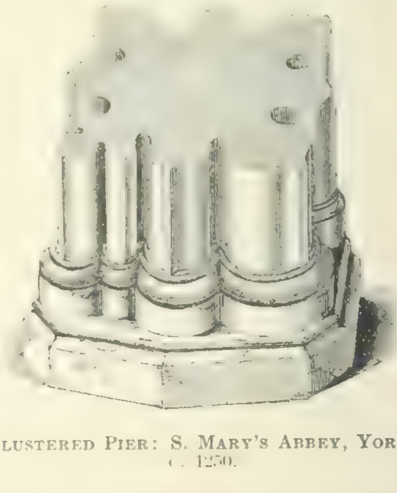
COAT. A layer of paint, plaster, mortar, or the like as applied to a wall or floor. The term is restricted to a liquid or semiliquid substance so applied. (See Veneer for a covering of solid material.)

COATING. According to English usage, the aggregate of several coats of paint, varnish, or plaster, applied in close succession as rapidly as permitted by good work.

In United States usage, same as Coat; or the operation of applying a coat.

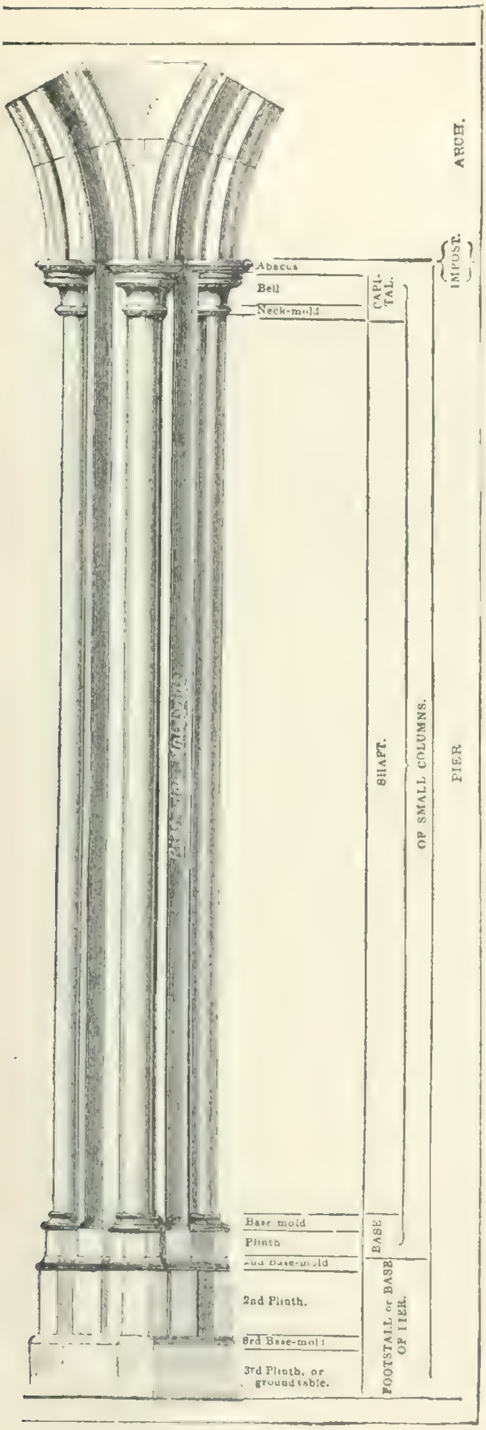
COAT OF ARMS. In heraldry, a complete arrangement of the bearings belonging to one person; usually an achievement. The term is without precise significance, for its original meaning is the embroidered surcoat of a man at arms in which his armorial bearings were shown, and in modern usage it covers sometimes the whole achievement, sometimes the escutcheon alone.

COATROOM. A room where out-of-door garments, small baggage, parcels, etc., may be left on temporary storage; as in a hotel, a railway station, or the like. (Compare Cloakroom.)



Clustered Pier: S. Mary's Abbey, York, c. 1250.

COB. A mixture of clay, straw, and gravel, or of similar materials, for the construction of walls of a primitive class.



CLUSTERED PIER

COBBLESTONE. A medium-sized stone worn round by marine or fluvial action. Cobblestones are used to make a very primitive and objectionable pavement for city streets; to pave the gutters of macadamized roads; and in some parts of Yorkshire (England), as well as in parts of the United States, to build the walls of cottages.

COB HOUSE. A house constructed with walls of cob.

COCHIN CHINA, ARCHITECTURE OF. (See Farther India, Architecture of.)

COCHLEA. A winding stair; also a turret or tower containing such a stair.

COCHLEARY; COCHLEATE; COCHLEATED. Spirally or helically twisted, like a snail shell; as, a cochleary stair.

COCK. A mechanical device for controlling the flow of water or other liquid, either at any point in the line of pipe (stop cock), or at an outlet end of a pipe line, in combination with a nozzle or discharge spout at a plumbing fixture (bibb cock, faucet). Cocks are designated by the fixture for which they are intended (as a basin or bath cock); by the service which they are intended to render; by their mechanical construction (ball cock, compression cock, three-way cock, ground key cock, self-closing cock); or by the fluid flowing through them (water, gas, steam cock). (See Faucet.) — W. P. G.

Bibb Cock. (Sometimes abbreviated "bibb.") A fitting for the discharge of water into fixtures, usually with a bent down nozzle. W. P. G.

COCKERELL, CHARLES ROBERT; architect and archæologist; b. April 28, 1788; d. Sept. 17, 1863.

C. R. Cockerell was the second son of Samuel Pepys Cockerell (see Cockerell, S. P.), and in 1809 became an assistant of Sir Robert Smirke (see Smirke, R.) during the reconstruction of Covent Garden theatre, London. In 1810 he commenced a tour of Greece, Asia Minor, Sicily, and Italy. April, 1811, with Baron Haller von Hallerstein (see Haller von Hallerstein), architect of the king of Bavaria, Baron Stackelberg (see Stackelberg), and others, Cockerell went to Ægina and excavated the ruins of the temple of Minerva (then called temple of Jupiter Panhellenius). In 1812 they excavated the ruins of the temple of Apollo Epicurius at Bassæ, near Phigaleia in Arcadia. The frieze of this temple was bought by the British Museum in 1813. Cockerell published the results of his investigations under the title *The Temple of Jupiter Panhellenius at Ægina, and of Apollo Epicurius at Bassæ, near Phigaleia in Arcadia* (London, 1860, 1 vol., folio). His studies of the *Temple of Jupiter Olympus at Agrigentum* were published in 1830 with other monographs by W. Kinnard, T. L. Donaldson, W. Jenkins, and W. Railton in a volume supplementary to the *Antiquities of Athens* by Stuart and Revett. He was appointed surveyor of S. Paul's cathedral in 1819. About 1830 he began the National Monument in Edinburgh, which was never completed. In 1833 he succeeded Sir John Soane (see Soane, Sir J.) as architect of the Bank of England. He was elected associate of the Royal Academy in 1829, and in 1836 Royal Academician. From 1840 to 1857 he was professor of architecture at the Royal Academy, London. In 1847 he succeeded Harvey Lonsdale Elmes (see Elmes, H. L.) as architect of S. George's Hall, Liverpool. His designs for the sculpture of the pediment of this building were published in the papers of the Royal Institute of British Architects (1863–1864, p. 17). Cockerell was president of the Royal Institute of British Architects in 1860–1861, *Chevalier* of the *Légion d'Honneur*, member of the American Institute of Architects, etc. He was buried in S. Paul's cathedral. Much of his success was due to his skill in drawing the human figure.

Sidney Smirke, *Professor C. R. Cockerell*, in R. I. B. A. papers, 1863 1864; Obituary in *Builder*, 1863, p. 683.

COCKERELL, FREDERICK PEPYS; architect; b. 1833; d. Nov. 7, 1878.

A son of C. R. Cockerell (see Cockerell, C. R.). He built the memorial column at Castle Howard (England), and the Freemasons' Hall in London.

Obituary in *Builder*, Nov. 16, 1878.

COCKERELL, SAMUEL PEPYS; architect; b. about 1754; d. July 12, 1827.

Cockerell was descended from Paulina, a sister of the famous Samuel Pepys, author of *Pepys's Diary*, and secretary of the admiralty in the reign of Charles II. He was a pupil of Sir Robert Taylor (see Taylor, R.). He was surveyor of the East India House, and held other important offices. (See Cockerell, C. R.)

Redgrave, *Dictionary of Artists*.

COCKING. Same as Caulking.

COCKLE. *A.* The same as Cochlea and Cochleate; used either as a noun or adjective; helically winding.

B. A kiln or furnace for drying (1) hops; (2) porcelain ware or *biscuit* after it has been dipped in the glaze, and before the burning.

COCKLOFT. The loft or garret under a roof, above the highest ceiling; usually waste space, or used for storage. A story in the roof, finished for occupancy, with ceilings, windows, etc., is not a cockloft.

COCKPIT. *A.* An enclosed area for cock fighting; hence, by extension, a building for such a purpose.

B. The pit of a theatre. Obsolete; in use as late as the close of the sixteenth century; so called from its form and general appearance, resembling that of *A.*

C. In local English usage, the Treasury or Privy Council Chambers, from the popular name of the building opposite Whitehall, Westminster (London), in which these offices were formerly domiciled.

CODUCCI, MAURO (MORETTO), of Bergamo, "Moro Lombardo" (Muntz); architect and sculptor.

In a document dated July, 1476, the design and construction of the fine church of S. Michele in Isola at Venice is ascribed to "Moretto di Lorenzo da Venezia" (Moschini, op. cit.). In 1482 "Moretto" took charge of the works at the campanile of S. Marco, and June 12, 1483, was chosen proto-maestro of the new church of S. Zaccaria (Venice), begun by Antonio Gambello (see Gambello, A.). He built the great stairway of the Scuola di S. Marco. In the memoranda of a lawsuit between his heirs and the authorities of the church of S. Maria Formosa (Venice), in 1506, Mauro di Coducci is mentioned as the architect of that building. The names Moro, Moretto, Moreto, appear frequently in the Venetian records at this time, but they do not always refer to the architect Coducci.

Paoletti, *Rinascimento*, Vol. II.; Müntz, *Renaissance*; Moschini, *Guida di Venezia*.

CŒLANAGLYPHIC. (See Relief.)

COELMANN, EGIDIUS; architect.

Egidius Coelmann rebuilt the choir of the *Liebfrauenkerke* at Amsterdam, which had been destroyed by fire in 1452.

Galland, *Holländische Baukunst und Bildnerei*.

CŒNACULUM. In ancient Roman houses, the supper room, and hence often any upper room or suite of rooms, because the *cœna* was commonly eaten in an upper room. It is also applied to a banqueting room, and in a few instances to boxes in the upper tier of a circus.

COFFEE HOUSE. In England, in the seventeenth and eighteenth centuries, a kind of tavern, especially devoted to the taking of coffee and chocolate, indulging in conversation, etc. The custom is obsolete except in history and literature. At the present time, a place of refreshment, often one from which alcoholic drinks are excluded.

COFFEE ROOM. In England, and until very recent times, the principal eating room and sitting room of a hotel; the hotels not being large, or affecting much elegance before the middle of the nineteenth century, there was little in the way of reception room or drawing-room. Ladies were supposed to have a sitting room of their own, and gentlemen guests met friends in the coffee room, which served also for meals.

COFFER. In classic and neoclassic architecture a recessed panel, usually square or octagonal. Such panels are common in the inner surfaces of cupolas, wagon vaults, and the like, and are, in original Roman construction, as in the Pantheon, the basilica of Maxentius, etc., a sinking in the solid masonry. In modern work, coffers are most often produced in lath and plaster, or other thin and cheap material. (Same as Caisson, II.)

COFFER DAM. A temporary dam made to exclude the water from a place upon which it is desired to build. In the usual form it is composed of an outer and an inner row of piles with waling pieces, or stringers, to guide and support the sheet piling which is driven between the piles of each row, forming a double enclosure. The space between the rows is then cleaned of all material not water-tight, and filled in with puddled clay and gravel to make the enclosure water-tight. It is sometimes made of large timber piles driven close together, jointed and caulked, and tied together with waling pieces. A bank of earth is sometimes sufficient in shallow water. The water is pumped out, and the construction proceeds. — W. R. H.

COFFERING. The whole of the coffers of a ceiling, or the system of coffers constituting its design. (See Caisson, II.)

COGGING. (See Caulking.)

COG HOLD. A connection for securing two intersecting horizontal timbers in a framed structure, consisting of a tongue formed in the upper part of one timber which engages in a notch cut in the under side of the other.

COIGNE. *A.* Primarily, a wedge; hence, the corner of a building, and finally, one of the stones forming the corner. In this sense these forms are obsolete. (See Quoin.)

B. A wedgelike block resting on any inclined surface to bring the masonry up to a level bed.

COILANAGLYPHIC. (See Relief.)

COIN. (See Coigne.)

COIT. In England, an early type of building combining a cattle stable, barn, and dwelling (Addy).

COLARD (COLART) DE GIVRY; architect; d. Dec. 18, 1452.

Colard appears to have succeeded Jehan d'Orbais as *maître d'œuvre* of the cathedral of Reims in 1416. He built the great choir screen (jubé) of that cathedral, which was destroyed in 1747.

Bauchal, *Dictionnaire*; Lance, *Dictionnaire*.

COLAS, ANTHOINE (ANTOINE); architect.

Maître d'œuvre et expert juré of the city of Troyes. About 1461 he succeeded Simon Royer as *maistre des maçons* of the cathedral of Troyes, and undertook the decoration of the beautiful southern portal. In 1470–1473 he worked on the pillars and vaults of the nave.

Assier, *Les Arts et les Artistes dans l'ancienne Capitale de la Champagne*; Bauchal, *Dictionnaire.*

COLD GRAPERY. A building, mainly of glass in light sash, used for the cultivation of grapevines, but without artificial heat. (See Greenhouse.)

COLDROOM. A room for cold storage; that is to say, one in which, while nothing shall be frozen, everything shall be kept at a low temperature. This is usually done by the presence of ice which, as it melts, chills the air within the room; but precautions have to be taken to carry away the water which flows from the ice, and to prevent too great a fall of temperature.

COLECHURCH, PETER OF. (See Peter of Colechurch.)

COLIN, ALEXANDER; sculptor and architect; b. 1536; d. 1612.

There is a contract dated March 7, 1558, between the elector Otto Heinrich and the sculptor Alexander Colin of Mecheln, for carving the coat of arms over the door of the Otto-Heinrichsbau in the castle at Heidelberg, Germany, and for fourteen statues and fourteen windows. After finishing this work Colin was called to Innsbruck (Austrian Tyrol) by the Emperor Ferdinand I., to complete (1562–1566) the monument to Maximilian I. in the *Hofkirche* which had been begun by Peter Abel. Attributed to Colin are the fountain in the *Thiergarten* at Innsbruck (1564), the monument of the Emperor Ferdinand I. in the cathedral of Prague (1564–1589), and other monuments at Innsbruck and elsewhere.

Ritter von Schonherr, *Alexander Colin und seine Werke*, in *Mittheilungen des Heidelberger Schlosses*; Rosenberg, *Quellen zur Geschichte des Heidelberger Schlosses*; Koch-Seitz, *Das Heidelberger Schloss.*

COLIN DE BERNEVAL. (See Berneval, Colin de.)

COLISEUM. The largest Roman amphitheatre known to us. It stands in Rome southeast of the Forum, in a flat which continues the valley in which the Forum is situated. Its exterior is well preserved for about four fifths of its perimeter, except that the fittings of the uppermost part are uncertain. It was built by Vespasian and his son and successor, Titus, at least as far as the top of the third story of the exterior, the solid wall with pilasters forming the fourth story having been added in the third century. (Also spelled colosseum.)

COLLAR. *A.* A decorated cincture, belt, or band about a column or other member, whether actually a separate piece, or a moulding formed in the substance itself of the column. Hence, a necking in a classic Tuscan or Doric or Greek Ionic capital. (See Order.)

B. A metal band applied for strengthening, as to the head of a pile to prevent splintering.

C. A collar beam.

COLLEGE. *A.* An institution governed by a body of men associated for literary or ecclesiastical pursuits; especially an institution of learning to which students resort after leaving the ordinary schools, and at an age, usually from sixteen to twenty years.

B. A building intended for use in higher education, is more commonly a group of buildings bringing together the necessary accommodation for a number of students and their professors and other teachers. The colleges of the English universities are separate corporations which unite in having a common tie in the University Senate and its chancellor or vice chancellor. Each college has one or several buildings, and these are generally arranged on the four sides of open courts, generally called quadrangles. The essential buildings are the rooms of lodging for students and tutors, fellows, and chiefs of the college, for the lecture rooms are usually at another place, in a building common to the university. The older colleges have, however, each a very stately hall and sometimes also a chapel; and in certain cases the chapel is a building of peculiar magnificence, as in the instance of King's College at Cambridge. The buildings of the colleges are so commonly of an interesting type of Tudor or Jacobean architecture that those styles when applied to domestic and civic work have gained the name of Collegiate Gothic.

In America, colleges are independent of one another, and a university is merely a college which is rich and has added postgraduate and other courses to its usual academic course. The architecture of colleges and universities is, therefore, the same, and the tendency is to build separate and detached buildings standing about in the grounds occupied by the institution without much common plan. A serious attempt was made at Yale College, beginning in 1868, to enclose with the different dormitories, chapels, etc., a very large quadrangle, but the spirit of continuity was not sufficient, and the plan did not wholly succeed. Trinity College in Connecticut, near Hartford, was designed by William Burges of London, with three small quadrangles. The great Baltimore institution, Johns Hopkins University, has no decorative buildings, but simply such structures as are absolutely needed for the lecture rooms, laboratories, etc., and these are scattered about the city. Columbia University, New York, has moved twice within forty years, first from what is now the business part of the city to Forty-ninth Street and Madison Avenue, and, in 1897, to West One Hundred and Sixteenth Street where a large plot of ground has been secured and where buildings of great cost and permanence have been erected. These colleges differ among themselves in that some have dormitories and others provide no lodging rooms whatever. — R. S.

Christ Church College. One of the old established colleges of Oxford University, occupying buildings which surround a very large court. The hall is peculiarly interesting because of the interior of the hall proper, which was built under the direction of Cardinal Wolsey in a beautiful late Perpendicular style, with an open timber roof of oak, richly carved, and a beautiful vestibule built in 1640 and roofed with fine vaulting in a style of an earlier period. It is also the largest hall in Oxford, the dimensions usually given being 40 feet wide by 50 feet high to the ridge, and about 114 feet long. The great court or quadrangle is known as "Tom Quad," the name being derived from the great bell in the tower over the gateway, always called Tom or Tom of Oxford, or the Mighty Tom, and said to weigh seventeen thousand pounds. The college has another quadrangle called Peckwater, the principal buildings upon which are of Palladian architecture built in the eighteenth century. The cathedral at Oxford, the smallest, but one of the most interesting, in England, is immediately connected with Christ Church College and is entered from the Tom Quad. — R. S.

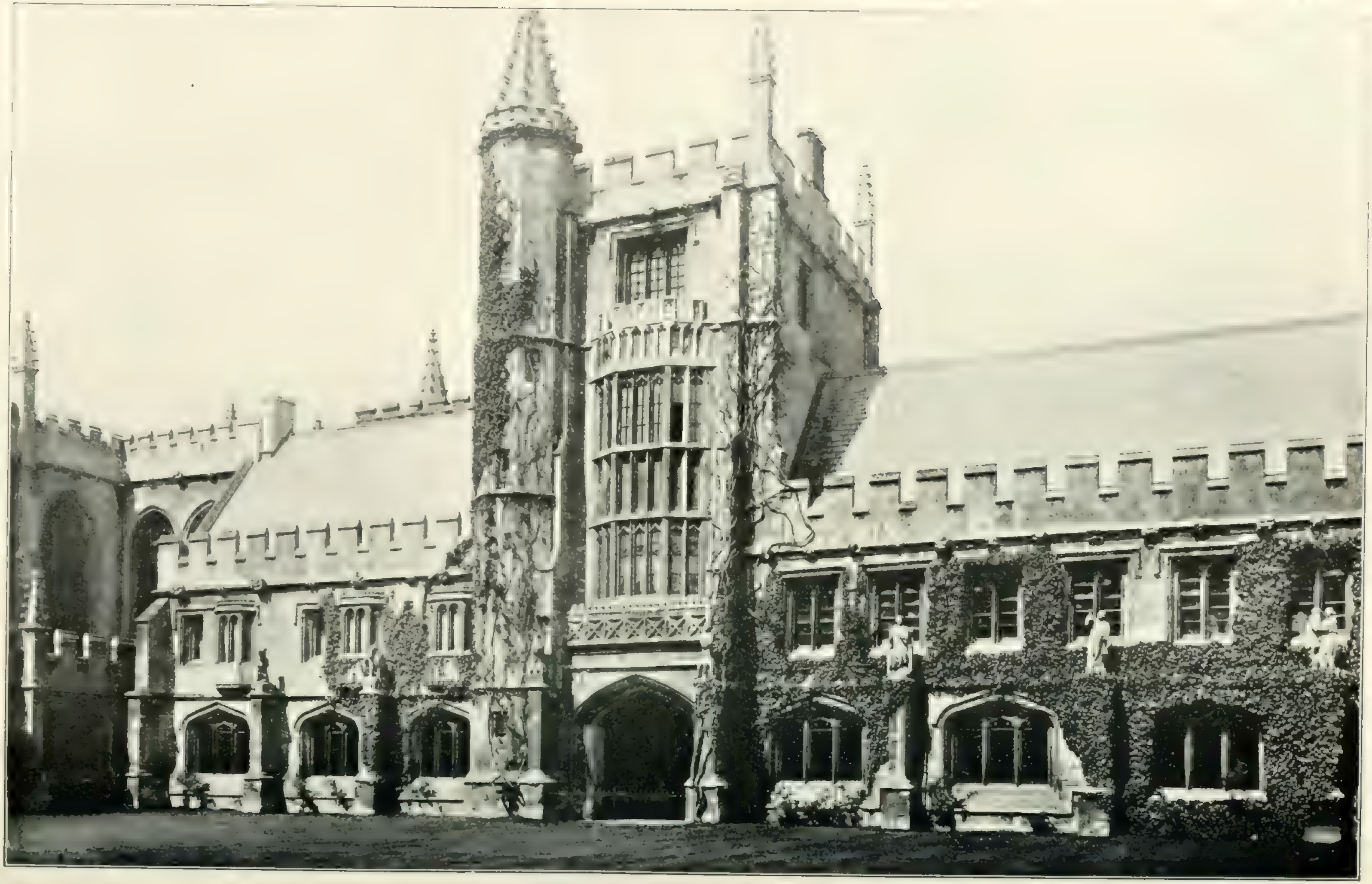
Keble College. One of the colleges of Oxford University; a new foundation, dating from 1868, and named after the Rev. John Keble, author of *The Christian Year*. The buildings are of an interesting type of Victorian Gothic by one of the best masters of the style, Butterfield. The Keble Memorial Chapel is peculiarly interesting.

King's College. One of the colleges of Cambridge University, England. Founded by Henry VI., and the earliest important establishment in Cambridge, but containing none of the earlier buildings except the chapel. The hall is, however, interesting, with a splendid Jacobean screen of carved wood. The great row of buildings designed by Gibbs and built in the early part of the eighteenth century is an interesting piece of late neoclassic work.

King's College; Chapel. The oldest part of the college and an unsurpassed building of English Perpendicular architecture. The fine vaulted ceiling is one of the three important pieces of that singular and wholly English design existing (the other two being S. George's Chapel at Windsor and Henry the Seventh's Chapel at Westminster) and this exceeds the others greatly in size. No cathedral in England has a more impressive interior than this superb building, more than 300 feet long and divided into twelve uniform bays.

Magdalen College; Tower. (Always pronounced Maudlin.) One of the earliest colleges of Oxford, founded in the fifteenth century, and retaining some of its ancient buildings. The tower, of Perpendicular Gothic, and said to be 145 feet high, is near the head of the bridge over the Cherwell, and is one of the finest Gothic towers existing. The hall is mostly of the sixteenth century, but the ceiling is much later and not appropriate. The Gardens (Magdalen Groves), and Magdalen College Walks are celebrated, partly on account of the view of the college buildings which they afford.

Medical College. An institution for the training of physicians and surgeons. The build-



COLLEGIATE ARCHITECTURE

Magdalen College, Oxford. Founder's Tower, containing the Founder's Chamber, with the adjoining buildings; the old hall on the left. The building was not begun until 1457; and although there have been repairs and elaborate restoration in the present century, the character of early Tudor architecture has been well maintained.

ings for such an institution require some rooms and halls peculiar to the course of study, and not found elsewhere (see Anatomical Theatre; Dissecting Room). Medical colleges are usually located in the great cities on account of the opportunities for observing clinical treatment and surgical practice. Even in cities, however, it is quite usual to found a hospital in immediate connection with a medical college for the express purpose of furnishing clinical instruction. The treatment in such hospitals, or at least in the open wards of them, is usually gratuitous, the patient submitting to the comparative publicity of treatment in the way of compensation for the medical and surgical aid furnished. Laboratories and rooms for histological and other forms of research form part of a highly organized medical college, but their presence does not involve any architectural peculiarities.

— R. S.

New College. One of the oldest colleges of Oxford University, founded by William of Wykeham in the fourteenth century, and retaining still many buildings of that epoch. The chapel is of peculiar importance in the history of English Gothic, as it is reputed to be the earliest Perpendicular building, and of very beautiful design.

Robert College. Near Constantinople, on a hill overlooking the Bosphorus; founded by a New York merchant and built about 1865.

Saint John's College. *A.* One of the old colleges of Cambridge University, England. The buildings are of different dates, from about 1500 to 1831, and enclose three courts or quadrangles on the right bank of the Cam, and one on the left bank, each of these groups forming a separate structure of architectural importance. The oldest buildings are of fine Tudor (Collegiate Gothic) style, as is the bridge which connects the two groups. The dining hall is a noble room with an open timber roof, dating from about 1610, and the combination room is a low-ceiled Jacobean hall of great beauty.

B. A college of the University of Oxford, founded in the middle of the sixteenth century. Part of the front is of a still earlier time, the remains of a monastery of the fifteenth century; but the most celebrated part of the building is the second quadrangle, which was built by Inigo Jones in continuation of earlier work, and which, in grace and refinement, is the nearest approach in England to Italian Renaissance architecture. Bronze statues of King Charles I. and of Queen Henrietta Maria fill niches over the gateways. The stone work has suffered much from the weather, but this adds antique charm to the whole without detracting from its proportions.

— R. S.

Trinity College. The most important foundation of Cambridge University. It was founded by Henry VIII., and the chapel was built during the reigns of Mary and Elizabeth, though since refitted and lined with neoclassical woodwork and an enormous columnar altarpiece. The great court upon which the perpendicular windows of the hall look has towered and battlemented gateways of interest, and a late neoclassic fountain. A small court called Neville's Court is in part faced with buildings by Sir Christopher Wren in Roman Doric and modified Ionic styles, which decorate the exterior of the library. — R. S.

COLLEGE HALL. The large general meeting room of a college; especially, in England, a room usually forming a building by itself with windows on both sides and often a roof whose interior construction is made decorative. Such halls form usually a part of the quadrangle, or more properly of the continuous wall of buildings which enclose a quadrangle. (See College; Hall.)

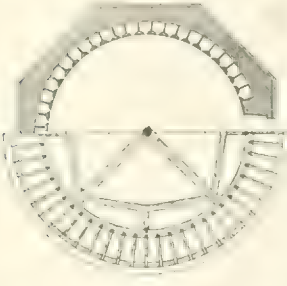
COLLEGIATE ARCHITECTURE. Architecture having the characteristics of a college; particularly used of the style employed in the mediæval and Elizabethan colleges of the great British universities, with their quiet courtyards or quadrangles, mullioned windows, battlemented parapets, picturesque chimneys, bays, and oriels.

COLOMBE, MICHEL; sculptor and architect; b. about 1430; d. 1512.

Colombe probably came from Brittany (France). About 1445 he visited Burgundy, and came in contact with the works of Claux Sluter (see Sluter, C.), Claux de Werwe (see Claux de Werwe), and others of the Burgundian school. About 1460 he opened an atelier in the *Rue des Filles-Dieu*, at Tours (Indre-et-Loire, France). About 1480 he designed a monument for Loys Rohault, Bishop of Maillezais in Poitou, France, and a retable for the church of S. Saturnin, at Tours, which was destroyed in the Revolution. His most important work is the monument which Anne de Bretagne, queen of Louis XII., ordered in 1502 in memory of her father, François II., Duke of Brittany, and his second wife, Marguerite de Foix. The design was made by Jean Perréal (see Perréal, J.), and the execution superintended by Colombe after his seventieth year. This monument was broken up in 1792. The fragments were put together in 1817 and placed in the transept of the cathedral of Nantes. His fine bas-relief of "S. George and the Dragon," formerly at the château of Gaillon, is now in the Louvre.

Palustre, [illegible] *Arts* (1884); [illegible] *sance*; Fillon-Rochebrune, *Poitou et Vendée*; [illegible] Brownell, *French Art*; Charvet, *Jean Perréal.*

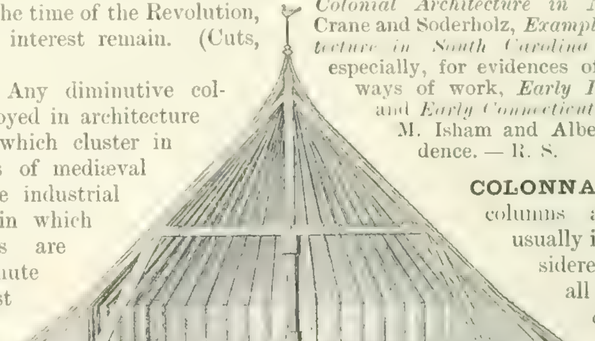
COLOMBIER. In French, a pigeon house. In English, a large building of the sort, a separate tower of considerable size and importance, such as were attached to large farms, manor houses, and strong castles in the Middle Ages. The maintenance by the lord of the manor of a great number of pigeons which fed freely on the fields of his tenants was one of the crying abuses of the feudal system. Throughout France, these towers were commonly destroyed at the time of the Revolution, but a few of great interest remain. (Cuts, cols. 641, 642.)


Colombier at Boos (Seine-Inférieure); Half-plan of Tower, Half-plan of Roof. (See Section.)

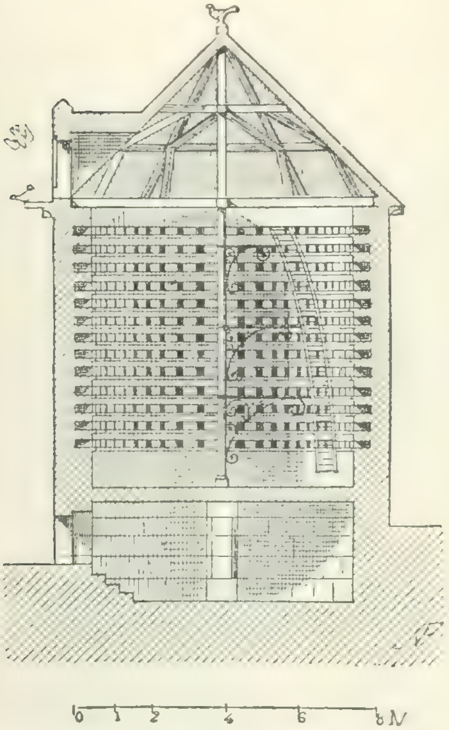
COLONETTE. Any diminutive column, whether employed in architecture proper, like those which cluster in the triforium piers of mediæval churches, or in the industrial or accessory arts, in which architectural forms are imitated on a minute scale. The earliest examples are those figured in Assyrian reliefs as supporting the architraves of a sort of clerestory windows; they are not uncommon on late Roman sarcophagi, and become very frequent in mediæval art.

COLONIAL ARCHITECTURE. That of a colony, or colonies; especially, in American use, that which prevailed in the British settlements in America previous to 1776, and by extension, and because the style cannot be distinctly separated into chronological periods, as late as the beginning of the present century. It is a modification of the English Georgian style, and deserves some part of the attention which it has received because of the singular results of transferring the classic designs of the eighteenth century to a new country where wood was largely used and where the workmen were far less restrained by an educated public opinion. The greater part of the buildings of the style are purely classic in their intent; but there exists in New England a number of buildings in which a much earlier tradition of building and simple decoration exists. An Elizabethan or Jacobean freedom of treatment, especially in interior work, is to be found in some of these structures. (See United States, Architecture of, Part II.)

Wallis, *Old Colonial Architecture and Furniture*, Boston, 1887; *The Georgian Period*, published by the American Architect and Building News Co. (Part IV., 1899); Chandler, *The Colonial Architecture of Maryland, Pennsylvania, and Virginia*; Corner and Soderholz, *Examples of Domestic Colonial Architecture in Maryland and Virginia* and *Examples of Domestic and Colonial Architecture in New England*; and Crane and Soderholz, *Examples of Colonial Architecture in South Carolina and Georgia*; and especially, for evidences of English traditional ways of work, *Early Rhode Island Houses* and *Early Connecticut Houses*, by Norman M. Isham and Albert F. Brown, Providence. — R. S.


Colombier at Boos (Seine-Inférieure); Cross-section. (See Plan.)

COLONNADE. A number of columns arranged in order, usually in one line, and considered in connection with all the details of the order, and sometimes with the roof, pavement, stylobate, and other adjuncts. The term is usually limited to structures in which the columns carry an architrave, and excludes the arcade. When a colonnade is carried along three or four sides of the exterior of a building, or of a large court or garden, it is called a peristyle. When attached to a building to which it serves as entrance porch, it is called a portico; and this meaning is often extended to roofed colonnades of any description. Colonnades in Grecian architecture are peculiar in the placing of the corner column, as in the exteriors of Doric temples, at a smaller distance from the two neighbouring columns than the other columns are from one another, this on account of the supposed need of greater effect of solidity at that point. The columns being all set somewhat out of the true vertical (see Refinements in Design), the corner column is put the most out of plumb. (For the distances between columns in a colonnade, see Intercolumniation.) The Grecian and Greco-Roman builders did not employ coupled columns; but this modification was introduced soon after the revival of classical architecture in the fifteenth century, and some of the most important architectural effects of the last four centuries have been produced by this arrangement; such as the great colonnade of the Louvre, built in the reign of Louis XIV.



Colombier on a Farm at Pougues (Nièvre). Cross-section.

R. S.

COLONNE DE JUILLET. A memorial column in Paris, erected on, or near, the site of the Bastille. It was built in the reign of Louis Philippe.

COLONNE VENDÔME. A memorial column in Paris, erected first by order of Napoleon I., and originally crowned by a statue of the emperor in classical costume. This statue was taken down under the Restoration, and was replaced under Louis Philippe by a statue of Napoleon in his military dress, replaced later by another studied from the original statue. The column was destroyed in 1871 by the revolutionists of the Commune, but it was rebuilt in 1874 with the old material.

COLOUR IN ARCHITECTURE. (See Polychromy.)

COLUMBARIUM. In Roman architecture, a dovecote; and hence, from the fancied resemblance in appearance: —

A. A series of small niches in a sepulchre, to contain the cinerary urns with the ashes of the deceased. The urns were commonly sunken in the floor of the niche, disclosing only the top to view.

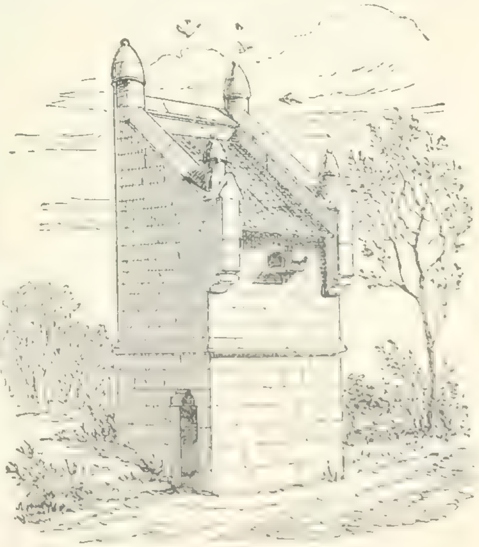
B. In modern usage, a tomb or group of sepulchres provided with *loculi* or niches as above described, of which many examples exist in Rome, and not a few in other parts of Italy and near Naples.

C. In recent times, a room or hall connected with a crematory and provided with niches to receive the cinerary urns.

COLUMBEION. A fountain in the atrium or forecourt of a Christian basilican church; its analogue is the fountain of ablutions in the courtyard of a Moslem mosque.

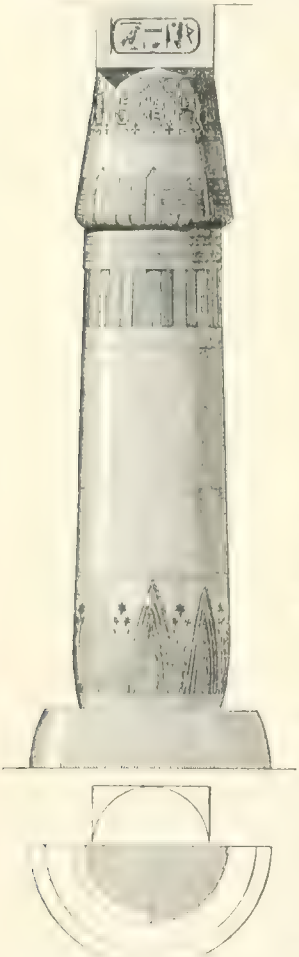
COLUMELLA (pl. –Æ). A colonette; the Latin diminutive. Used sometimes for a baluster.

COLUMN. *A.* A pillar or post; a pier rather slender than thick and especially one that carries a weight and acts as an upright supporting member. In this general sense, the word has been applied to the supporting parts of iron frames of all sorts; so that where the uprights of a piece of carpenter work would commonly be called posts, the cast iron or wrought iron uprights are called columns.



Colombier; Provence and Languedoc. Typical Form.

B. In special architectural sense, a supporting member of stone or some material used in close imitation of stone and composed of three parts, capital, shaft, and base; the shaft, moreover, being either cylindrical or approximately so, — that is, a many sided prism, or a reeded or fluted body whose general shape is cylindrical. In this sense a column need not carry a weight at all large in proportion to its mass; thus the decorative use of columns for memorial purposes involves the placing of a statue, a bust, a globe, a vase, or similar object slight in proportion to the column itself as the only weight superimposed upon the capital.


Column of Papyrus-bud Type; Thebes, Egypt.

The term is still employed where some one of the above characteristics does not exist; thus, in the earliest columnar architecture,—that of the Egyptians, — there is no base, and the earliest columnar structures of the Greeks, namely those of the Doric order, were also without bases. Capitals are, however, universal, and are to be considered as mainly decorative in character. (See Capital. See also Colonnade; Entablature; Order; Shaft; and the names of the different classical orders, as well as the different styles of architecture. For columns used for monumental purposes, see Memorial Column.)—R. S. (Cut, cols. 647, 648.)

Annulated Column. (See Annulated.)

Attached Column. Same as Engaged Column.

Banded Column. (See Banded.)

Clustered Column. Same as Clustered Pier; the term "column" in this sense is not accurate.

Commemorative Column. (See Mortuary Column below; also Memorial.)

Coupled Column. In plural, coupled columns; those set in a pair or in pairs. These may be in a continuous colonnade, as a peristyle or portico, and the disposition is then called Aræosystyle. (See Accouplement; Intercolumniation.)

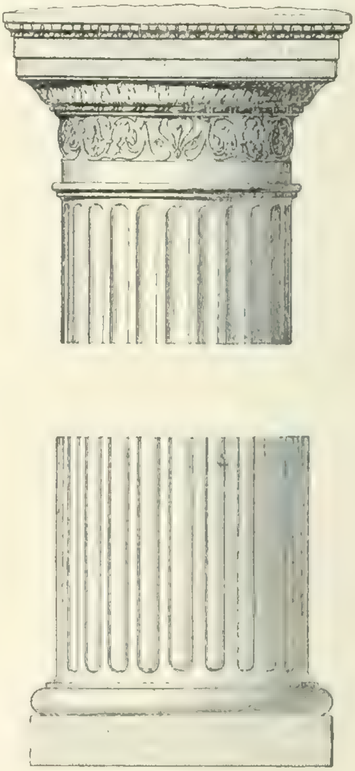
Engaged Column. (See under E.)

Knotted Column. A column, the shaft of which is shaped to appear as if tied in a knot, or as if composed of two ropelike parts interlacing.

Manubial Column. Properly, a column decorated with spoils of the enemy; hence a triumphal or memorial column of any kind.

Memorial Column. (See under M.)

Midwall Column. A column or the like which carries a part of a wall much thicker than its own diameter and which, therefore, stands about halfway between the face and the back of the wall, its axis being about the same as the axis of the wall. In some mediæval styles, slender columns are seen carrying very thick walls which rest upon them, and this disposition affects greatly the general design.

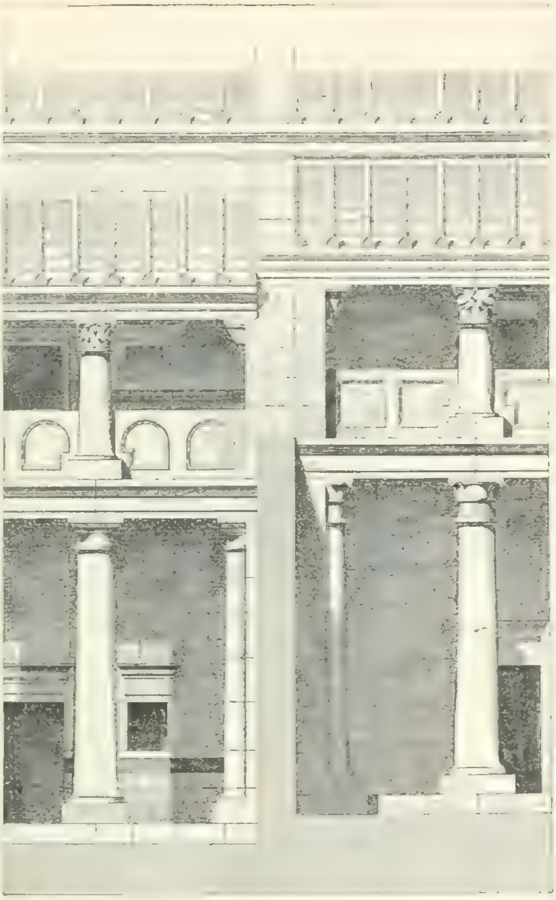

Column: Roman; from Tomb of Caius-Cestius at Rome.

Mortuary Column. Among the American Indians of the Northwest Coast, a wooden column, or two together, set up to support a box containing either the ashes or the body of the dead. Sometimes this column was elaborately carved. — F. S. D.

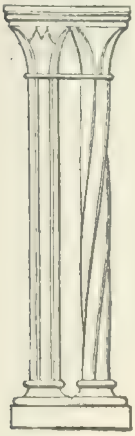
Rostral Column. *A.* The *Columna Rostrata* or pillar adorned with the beaks of ships, which stood in the Roman Forum, having been originally erected in commemoration of the victory of C. Duilius, 260 B.C. Other memorial and votive pillars of similar character were erected at different times, generally, as it appears, in commemoration of naval victories.

B. In modern usage, a pillar in which sculptured representations or suggestions of beaks of ships are used as decorative additions; sometimes erected either alone or in connection with other monuments in recognition of naval prowess.

Symbolical Column. A column used to support a representative figure or emblem, as the columns of S. Mark in Venice and other cities of the ancient Venetian dominion; or to commemorate an event or person, as a rostral column, the column of Trajan, the column in the Place Vendôme in Paris, etc.



COLUMN: SYRIAN ROMANESQUE; PORTICOES OF HOUSES NEAR SERDJILLA IN SYRIA.



COLUMNS: ITALIAN ROMANESQUE, OF S. ZENO, VERONA.

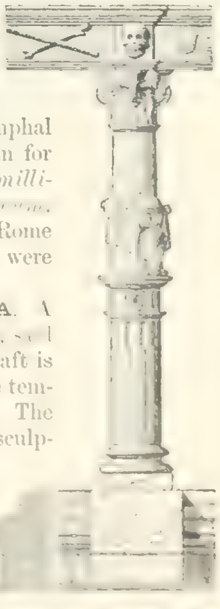
Trinity Column. A monument of slender and shaftlike proportions built triangular in plan, for at least a part of its height, as a specially sacred memorial. Several exist in Europe, but all of the seventeenth and eighteenth centuries, from which it appears that the fashion is of late origin.

Triumphal Column. Same as Memorial Column above.

Unbending Column. A column of which the diameter is of such proportion to its height, that, under vertical pressure, it cannot be fractured transversely by any tendency to lateral bending. This proportion of safety varies according to the material used, a column of iron or steel being much more slender for a given service than one of stone or marble, which finds its idea of stability in the proportions of the Greek orders.

Wreathed Column. A column so shaped as to present a twisted or spiral form.

COLUMNA. In Latin, a column; sometimes used in modern descriptions, in many cases with a qualifying adjective to designate special forms of column. Thus the *columna rostrata* was one adorned with effigies of ships' prows, in memory of a naval victory; *c. triumphalis*, a triumphal column like that of Trajan for his Dacian victories; *c. milliaria* or *milliarium aureum*, marked the centre of Rome from which all distances were measured.



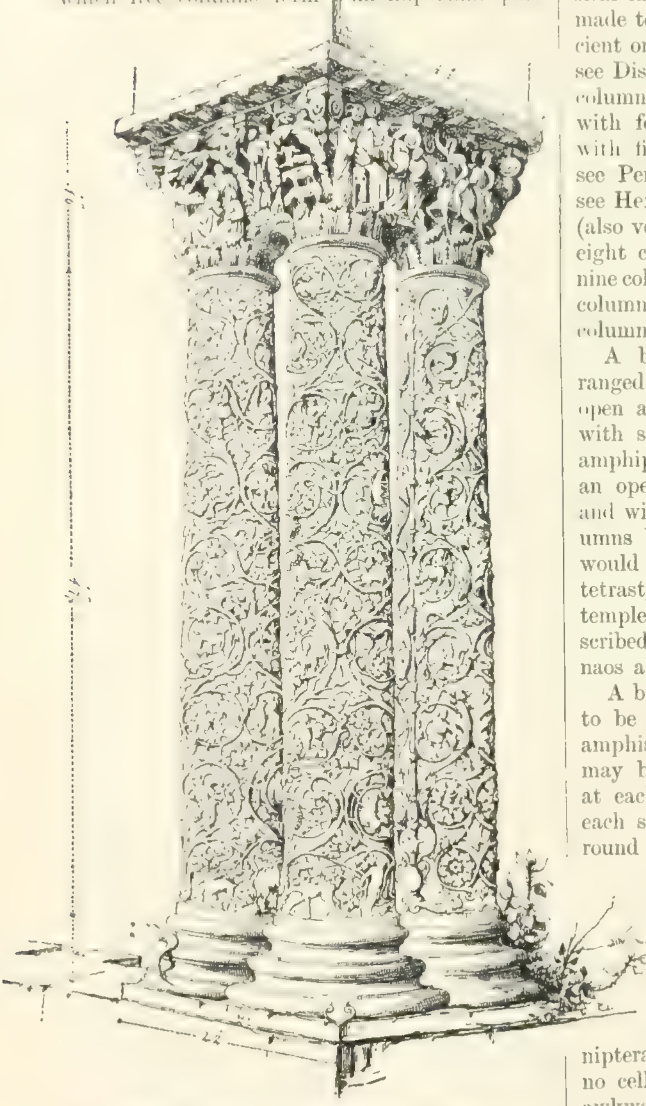
COLUMN, FRENCH RENAISSANCE, CEMETERY OF S. MACLOU, ROUEN.

COLUMNA CÆLATA. A column adorned by carving, and especially of one whose shaft is so adorned, as those of the temple of Artemis at Ephesus. The one shaft of which the sculpture is best known was adorned with probably eight figures of life size and larger; these are carved on the lowest drum of the shaft about 9 feet high and 6 feet in diameter. This drum is in the British Museum.

COLUMNAR *A.* Having the characteristics or form of a column.

B. Composed, or partly composed, of a column or columns; having columns as the principal, or as a very important, element of a design or structure.

COLUMNAR ARCHITECTURE. One in which free columns form an important part of the structure and design. (For the architectural character and history of such styles of architecture, see Grecian Architecture; Greco-Roman Architecture; Greece, Architecture of; Neoclassic Architecture; Peristyle; Portico.)

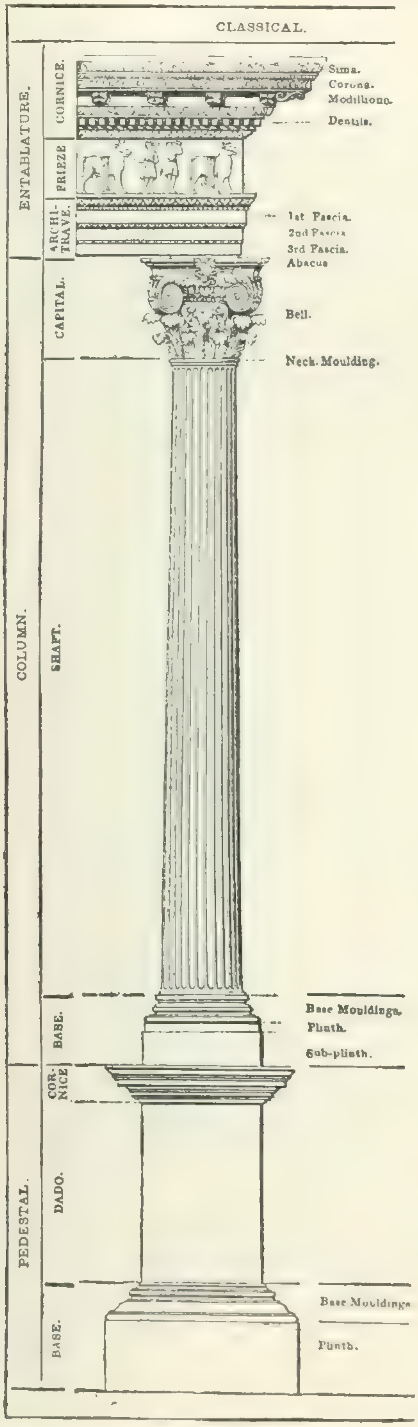


Columns: Italian Romanesque; Cloisters, Monreale, Sicily, c. 1187.

Columnar architecture has been so much studied by architects and archæologists that its technical terms, especially those indicating important differences in the character of its manifestations, are in common use; and their right understanding is necessary to the comprehension of much critical and historical writing on matters connected with architecture. Thus, the spacing of the columns in a portico, as in the front of a temple or the like, is described by a number of terms, some really classical in their origin, others of modern coinage, made to resemble, as much as possible, the ancient ones. Thus, for porticos of two columns, see Distyle; Distyle in Antis. Those of three columns can hardly be said to exist. For those with four columns, see Tetrastyle. For those with five columns (a very rare arrangement), see Pentastyle. For those with six columns, see Hexastyle. For those with seven columns (also very rare), see Heptastyle. For those with eight columns, see Octastyle. For those with nine columns, see Enneastyle. For those with ten columns, see Decastyle. For those with twelve columns, see Dodecastyle.

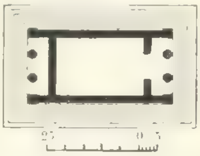
A building of any kind with columns arranged along the front of it forming a portico open at the ends is said to be prostyle. One with such a portico at each end is said to be amphiprostyle. In this way, a building with an open portico of four columns at one end, and within that a closed portico with two columns between two wing walls and two antæ, would be described briefly as follows: prostyle tetrastyle with pronaos distyle in antis. The temple of Nike Apteros at Athens may be described as amphiprostyle tetrastyle with pronaos and opisthodomos distyle in antis.

A building having columns all round is said to be peripteral, or peristylar; and the term amphistylar (more common in scientific uses) may be applied to buildings having columns at each end (see Amphiprostyle, above) or on each side. One with two rows of columns all round is said to be dipteral. It is, therefore, not necessary to speak of the temple of Apollo Didymæus at Miletos as peripteral dipteral; the latter word alone suffices for the description; or, if it is desired to state that it has ten columns abreast in the front, it might be spoken of as decastyle dipteral. The term monopteral has been used for buildings which have no cella, or naos, or secos; but this seems an awkward term. It is probable that decastyle temples were generally dipteral, because the naos was not needed wider than in an octastyle building, and the additional space was more apt to be given to the external splendour and convenience of a portico. On the other hand, the space of a large portico might, with care and skilful building, be obtained without the necessity of a double row of columns. Pseudodipteral has been used to describe a temple which has a portico on each side wide enough to hold a double row of columns, but actually containing only one such row. Some writers, however, use this term for the temple or the portico where there is a semblance of an inner row of columns; namely, a row of engaged columns built into the wall of the naos. The term aræosystyle has been invented to express the idea of that which is composed of coupled columns; thus, the great colonnade of the Louvre is called aræosystyle, by its columns being in pairs.



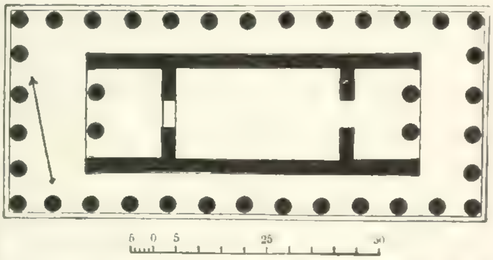
Columnar Architecture: Composite Order; Nomenclature of Members.

It is to be noticed that these terms ending in *-style* are generally adjectives. They are, however, often used substantively, so that it is not surprising to see the so-called Basilica spoken of more accurately as the "enneastyle at Pæstum." On this account, the alternate form ending in *-stylar* is sometimes used adjectively, and this is peculiarly necessary in the case of peristyle, which is so commonly used as a noun that peristylar must needs be employed as an adjective to qualify a building so disposed or so decorated. (See Peristyle; see also Peripteral and Dipteral.)



Columnar Architecture: Amphiprostyle Temple, each Portico Distyle in Antis.

Buildings having the above characteristics are named by Vitruvius as follows: A hexastyle building is called hexastylos; an octastyle building, octastylos; a decastyle building, decastylos; a peristyle building, peristylos; an amphiprostyle building, amphiprostylos. In imitation of these words the modern terms, pentastylos and enneastylos, have been introduced for pentastyle and enneastyle buildings, and others, such as heptastylos, may exist. Vitruvius also calls a dipteral building dipteros; a pseudo-dipteral building, pseudo-dipteros; a peripteral building, peripteros; and he uses the term hypæthros for a decastyle building of peculiar character. (See Hypæthral.)



Columnar Architecture: So-called Temple of Theseus, Athens; 5th Century B.C.

Hexastyle peripteral temple; pronaos and opisthodomos, each distyle in antis.

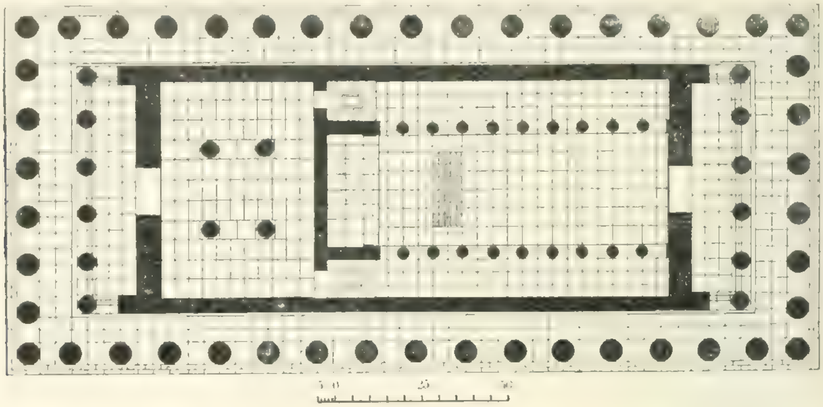
(For the terms used in describing the spacing of columns, namely, Aræostyle, Aræosystyle, Diastyle, Eustyle, Picnostyle, Systyle, see Intercolumniation.) (Cuts, cols. 651, 652.)

See bibliographies under Grecian; Greco-Roman; Neoclassic; Order; Roman Imperial; also under Architecture. — R. S.

COLUMNA ROSTRATA. Same as Rostral Column, for which see under Column.

COLUMNIATION. The employment or putting of columns; or the system or method of arranging these.

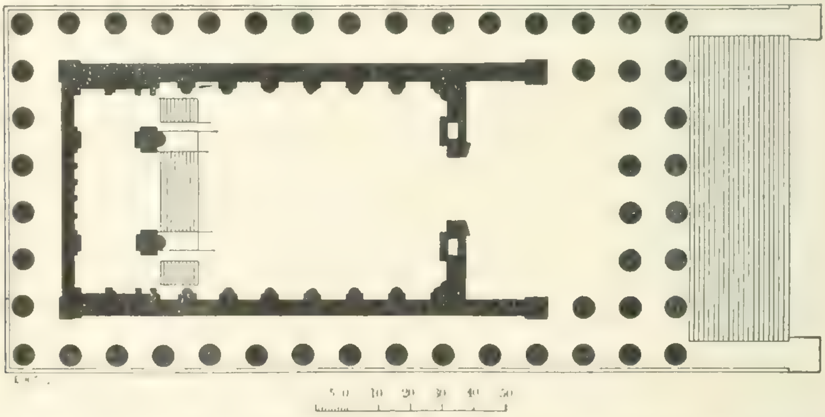
COLUMN OF ANTONINUS PIUS. A memorial column which stood in Rome not far from the existing column of Marcus Aurelius. It had a granite shaft about 50 feet high, which has been destroyed; but the marble pedestal, decorated with reliefs, is in the *Giardino della Pigna*, in the Vatican.



Columnar Architecture: Octastyle Peripteral Temple (Parthenon at Athens).

Two hexastyle porticoes within; epinaos (to left), hypostyle with four columns. Larger division of naos thought by some to have been partly hypæthral.

COLUMN OF CUSSI. A few miles southwest of Beaune (Côte d'Or) in Burgundy; of Roman epoch. It has still standing a pedestal in two stories and a part of the shaft. The capital is also in existence, having been found serving, with the centre hollowed out, as a well curb; a destination which reminds one of many of the cistern heads of Venice. (See Vera da Pozzo; Memorial Column.)



Columnar Architecture: Octastyle Peripteral Temple at Baalbek in Syria; the Entrance Portico Dipteral.

The shafts of the outer peristyle are smooth; the eight shafts within are fluted and form a pronaos with its own entablature.

COLUMN OF DIOCLETIAN. In Alexandria; same as Column of Pompey.

COLUMN OF JULY. (See Colonne de Juillet.)

COLUMN OF MARCUS AURELIUS. Erected about 176 A.D. in honour of the emperor who had finished the war with the Germans and Sarmatians, and which was copied closely from the column of Trajan. It stands in Rome in a square which opens out of the Corso.

COLUMN OF MENANDROS. At Melassa in Asia Minor, among the ruins of the ancient Mylassa; a column of the Corinthian order.

COLUMN OF PHOCAS. An antique column of Rome, and bearing a dedication to the Byzantine Emperor Phocas (602 to 610). It is thought by archæologists that the column belongs to an earlier time, and was either taken from a large ancient building, or had previously been dedicated to another person.

COLUMN OF POMPEY. In Alexandria, Egypt; erected under the direction of a Roman prefect, named Pompeius, in honour of the Emperor Diocletian. As it now stands it is 104 feet to the top of the Corinthian capital.

COLUMN OF TRAJAN. Erected by the Senate in honour of the emperor; built during, or immediately after, the reign of Trajan in connection with the gigantic forum, basilica, and temple which are all dedicated to that emperor. The column served as a model for that of Antoninus and for some modern works of the kind. It is in all 128 feet high without counting the statue, and originally occupied the centre of a court of relatively small size, apparently intended to allow the figure sculptures which covered the shaft to be seen and studied from the galleries around it. It is composed of large blocks of marble, and a spiral flight of steps goes to the top. The reliefs commemorate the wars and triumphs of Trajan.

COLUMN VENDÔME. (See Colonne de Vendôme.)

COLYN, JACOB; sculptor; d. 1601.

The most celebrated work of the sculptor Colyn is the fireplace of the *Rathhaus* at Kampen, Holland (1543–1545). He appears first in Utrecht in the accounts of the *Buurtkerk* (1544–1545). In 1580 he made the monument of the Archbishop Frederik Schenk van Toutenberg, and in 1585 the monument to Govert van Reede in the church of the village of Amerongen, Holland.

Galland, *Holländische Baukunst und Bildnerei.*

COMA, PEDRO. (See Pedro de Coma or Cescomes.)

COMACINE. (See Guild.)

COMBINATION ROOM. In English universities, a room serving the same purpose as common room; in a general way the characteristic of Cambridge University, as common room is of Oxford.

COMBING. Same as Coaming.

COMINELLI, ANDREA; architect.

Cominelli built between 1720 and 1750 the Palazzo Labia in Venice, famous for its frescoes by G. B. Tiepolo (see Tiepolo, G. B.). One of the most important palaces on the Canal Grande.

Gurlitt, *Geschichte des Barockstiles in Italien.*

COMITIUM. In Roman archæology, the meeting place of the original tribunes of Rome, and afterward the centre of legal authority. It appears to have been an open place, perhaps a part of the Forum, but its location is not accurately known.

COMMACINE. (See Guild.)

COMMAND (v.). To contain within itself the only or the principal passage to another room or set of rooms; said of a room other than a corridor or hall. In many ancient dwellings even of importance the rooms commanded one another; that is to say, there were no arrangements made for separate entrances to all; as when each room in one wing of a country house filled the whole width of it with windows on either side.

COMMANDERY. A building used by one of the military orders, such as the Templars, as the place of meeting and of the central control of a district. There were many such buildings in Europe as well as in the East, but they were usually of small importance. Some few, however, were strongly fortified and were formidable as places of defence. (Compare Preceptory.)

COMMESSO (Opera di). A kind of marble mosaic practised in Italy during the Middle Ages resembling *opus Alexandrinum* in the geometrical character of its design, and *opus sectile* in that each piece was cut to a particular shape fitting into those next it. The pavement of the baptistery at Florence is an example. Pictorial inlay, as in the floor of the Duomo at Siena, and Florentine picture mosaic, were later developments of the art.

COMMISSION. *A.* The sum paid an architect for his professional services, usually reckoned by a percentage on the cost of the work. The amount fixed by common consent in the countries of Western Europe and in the United States is 5 per cent for all buildings of a not unusual character; but buildings of very small cost or of great elaborateness require a larger allowance; and again a smaller commission is calculated on very costly structures. In like manner it used to be customary to charge 3 per cent for "stores," that is to say, large plain buildings for business purposes with but little architectural detail and no difficult problems involved in their structure.

B. Payment received by an architect from any person other than his regular employer. This is generally condemned by the profession and by persons employing architects; because, if the architect receives payment from a contractor or the seller of a certain building material or the like, he is apt to be, to a certain extent, secured for the interests of that person, and is less free to superintend thoroughly and enforce his decisions boldly.

COMMITTEE ROOM. A room especially provided for the meetings of a committee or committees. Such rooms are necessary in all legislative buildings, and in the buildings of organized bodies such as clubs, exchanges, and associations. They are usually of moderate size and somewhat retired from the more public portions of the building. In legislative buildings they should open from special lobbies or corridors accessible only to members, and should be in convenient proximity to the legislative hall.

COMMON ROOM. In an English college, a room which serves the place of gathering [illegible] the fellows and others, who control the affairs of the college, and who generally live in its buildings. It is, however, the hall, and not the common room, which is used for dinner and usually for other meals. The term originating in Oxford is general now except in Cambridge. (See Combination Room.)

COMMUNAL DWELLING. That occupied by two or more families in common; a joint tenement. Habitations of aboriginal Americans were generally communal, whether tipi, wigwam, iglu, or stone or adobe house. Environment largely determined the form and material; expedience and necessity, the situation. In character and location remarkable variety existed, giving rise formerly to theories of distinctly different races in America, but variation in form, material, or in situation of dwellings does not necessarily imply race variation. The communal principle pervaded American constructions, no matter what their form or situation, and dwellings each occupied by several related families were everywhere grouped in more or less compact villages of considerable permanence. A tribe held together for security as well as for social and agricultural reasons. Farming was carried on by most tribes, those living in arid regions where game was scarce being more farmers than hunters. To accomplish best results, groups of related families combined their work and their living, and such a group was the basis of American Indian organization and the origin of their communal dwellings. Game secured and crops produced by members of a gens or clan, as this group has been called, were property of the whole gens or clan, not of individual members, and the gens or clan assumed care and distribution of such property. Defence and subsistence thus dictated organization and also the character and position of dwellings. Forest regions supplied bark houses, but arid districts compelled a reliance on the soil for chief building materials, producing the monolithic or rock-excavated dwelling, the adobe house, and the stone house. Less willingly abandoned, these structures were comparatively permanent, and when finally deserted their ruins remained; while of the bark houses and similar dwellings nothing indicates their former existence. Of the bark communal dwellings, that of the Iroquois was one of the best examples (see Long House); while of the more durable constructions of adobe and stone there are still to be seen numerous good examples now occupied by the Pueblo Indians of the southwestern United States, as well as others in ruins.

(For details see, in this work, Casa Grande; Casas Grandes; Cavate Lodge; Central America, Architecture of, Part I.; Cliff Dwelling; Iglu; Iglugeak; Mexico, Architecture of, Part I.; Pueblo Houses; Tipi; Tupik; United States, Architecture of, Part I.)

Morgan, *Houses and House Life of the American Aborigines*; the writings of Dr. J. Walter Fewkes, Professor Ad. Bandelier; Mr. Victor Mindeleff, a paper in the *Eighth Annual Report of the United States Bureau of Ethnology*; and also other papers in this series of reports.

F. S. Dellenbaugh.

COMMUNION TABLE. A table for the Lord's Supper, introduced by the Protestant Reformers as a substitute for an altar, and to mark their protest against the doctrine of transubstantiation inculcated in the Sacrifice of the Mass. At first it was nothing more than a board set on trestles, and this was often taken apart and placed on one side when not in use; later it took the form of a domestic table. Its place in the church varies among the different sects, but usually it is placed against the east wall or in front of the pulpit, and sometimes it is elevated one, two, or more steps above the floor. (See Altar.) — C. C.

COMPARTMENT CEILING. A ceiling divided into compartments or panels separated by mouldings or ribs; particularly one in which the compartments or panels are not all uniform rectangles. (See Caisson, II.) The earliest were those of the Romans, some vaulted, some flat. They are almost innumerable in Renaissance architecture.

COMPASS (I.) (generally in the plural, Compasses). *A*. An instrument used in drawing and in the building trades for laying off, dividing, or measuring distances and for describing circles or arcs of circles. A pair of compasses of the ordinary type consists of two legs pivoted together at one end, and either pointed at the other (see Dividers) or provided with fixed or removable pencil, pen, and needle points for describing circles. For draughtsmen they are usually finely made of metal and commonly with steel points. Carpenters' and masons' compasses are much heavier, of steel or wood, and generally with an arc and thumbscrew for securing the legs at any angle.

B. (For Compass as used in surveys, see Surveying.)

Bar Compass. *A*. A compass of which one leg can be lengthened by inserting a piece with sockets and screws between the joint and the point, for the purpose of drawing a circle or arc with larger radius.

B. Same as Beam Compass below.

Beam Compass. One for describing circles larger than are practicable with the ordinary jointed compass. The two legs of the compass are secured by clamped slides to a long, light, and rigid beam or bar of wood or metal. In the finer instruments, this is provided with a scale and the slides with verniers for accurate adjustment.

Bow-Compass; Bowspring Compasses. Small compasses having the legs held by a strong spring instead of a pivot, and adjustable to any span by a fine screw which compresses the spring. They are used for minute work for which ordinary compasses are too coarse or heavy. A complete set comprises bow-dividers or spacers, bow-pen, and bow-pencil.

Three-point or **Triangular Compasses.** Those having three legs by which three points can be laid off at once.

COMPASS (II.) (adjectival term; the noun used attributively). Having, in part, a circular form or outline; as compass-headed roof, one whose inner surface is that of a circular semicylinder, or nearly so; compass brick, a brick having one side shaped to a circular arc, as for building a curved wall.

COMPENSATION (of architects). (See Commission.)

COMPETITION. In architectural practice, the submitting by different architects of designs for one and the same building, in order that the person or association proposing to build shall choose from among them. Architects regard competitions in very different ways, and with different degrees of disapproval. The difference of opinion is radical between those who think that the proper outcome of a competition should be the choice of a design to be carried out with but slight changes in actual execution, and those who think that the proper result is always the choice of an architect. It is said with some force by those of the latter way of thinking that in this case a competition is rather an absurdity; because, in most cases, an architect is better judged by his previously executed work than he can be by one design. The answer to this is merely that the problem involved in a competition will be judged of differently by different architects, and that it is well to ascertain which of the architects competing approaches the problem from the point of view agreeable to the employer. On the other hand, those who think that a design should be selected as the result of a competition are met by the answer that it very commonly happens that the design executed is widely different, and that even in its very essence, from the design accepted in the competition.

The whole matter of employing professional men in this way is, of course, abnormal and to be deprecated. The architect, like other professional advisers, should be called in at the very commencement of the work, and his opinion is as much needed in the choice of the site and the first formation of the owner's ideas as to what is needed for his building, as it is in the preparation of working drawings.

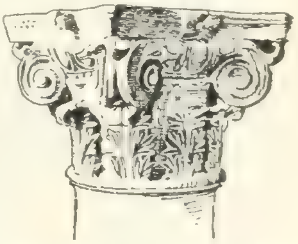
The terms under which competitions are conducted differ so very widely, and opinions about these terms and regulations are so very diverse, that they must be looked for in the columns of periodicals. Even during the past ten years, and in the United States alone, the contributions and communications printed in the different architectural journals would fill a large volume. — R. S.

COMPLUVIUM. The opening in the roof of a court, *atrium*, or *cavædium* of a Roman house. The roof sloped toward the *compluvium* from the surrounding walls, discharging its rain water into the *impluvium* (tank or reservoir) in the court beneath it. (See Cavædium.)

COMPO. A colloquial trade abbreviation of the word composition, applied to various plastic cements or pastes which harden on exposure, like *papier-maché* and similar substances.

COMPONENT. In mechanics, one of two or more forces which make up the force with which the constructor is concerned; or into which that force may be considered as being divided. Thus, in estimating the force of wind against a sloping roof, that force may be considered as resolved into two components, viz. one acting normal to the roof and producing a transverse stress on the rafters, the other acting in the direction of the slope and tending to overturn the roof. (See Parallelogram of Forces.)

COMPOSITE. Composed or compounded of a number of elements, especially somewhat diverse elements, united or harmonized into a congruous whole; used chiefly of artistic design, the corresponding term *compound* being employed in structural science. Thus we say a composite capital, a compound truss. But *composite* is sometimes used in structural nomenclature with reference to the union of divers materials, as timber and iron, in one construction. (Cut, cols. 659, 660.)



Composite: Earliest Use of it in Arch of Titus.

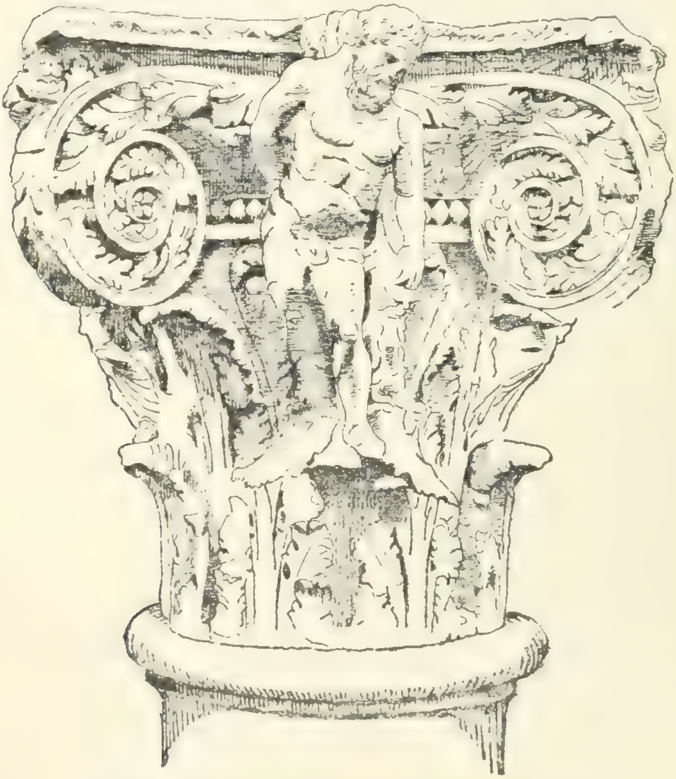
COMPOSITE ORDER. One of the five orders recognized by the neoclassic architects and described by the writers of the sixteenth century. In its original form it is a classical Roman adaptation of the Corinthian order; one of very many modifications which that order received to make it still richer and more elaborate, especially in the ornamentation of the capitals. As described by the sixteenth century writers, the capital consists of volutes and ovolo between them, borrowed, with modifications, from the Ionic capital, and of the rows of acanthus leaves applied to the lower part of the bell as used in the Corinthian capital. (See

Greco-Roman Architecture; Neoclassic Architecture; Order.) — R. S.

COMPOSITION (I.). *A.* In fine art, the act of arranging parts in a design; the term being equally applicable to colour taken by itself, or to line taken by itself, or to masses of light and shade, or to all the elements of the work of art considered as making up the general result. Also, the act of making such arrangements in design.

B. A design, considered as the result of several or many parts or elements combined into one. (Cut, cols. 661, 662.)

(For both these meanings see Design.)



Composite Capital in Lateran Museum at Rome

COMPOSITION (II.). A material made up artificially and used in modelling decorative friezes, centrepieces, and the like; a general term used for plastic material of unknown or unspecified make.

COMPOSITION OF FORCES. (See Parallelogram of Forces.)

COMPRESSION MEMBER; PIECE. In a framework, truss, or the like, a Brace, a Post, or a Strut, which are the more specific terms for pieces calculated to resist strains of compression in the direction of their length. The term is not usually understood as applying to a piece of material which merely sustains a weight through its resistance to crushing, as a template.

CONCALLI. In Aztec building, a storehouse. (See Calli.)

CONCERT HALL. A room especially intended for musical performances in public, and consisting of a stage or platform for the performers and singers, as well as instrumental musicians, and an auditorium which may be fitted with permanent seats or left unincumbered for the purposes of occasional use for dances and the like, the seats being movable. The size and character of such a room varies from the small recitation hall intended for a few performers and two or three hundred persons in the audience, as the upper room of a village or town hall, to a hall seating several thousands of persons, and allowing of a large orchestra and chorus consisting of many hundreds of performers. (See Acoustics; Auditorium; Theatre; and for the conditions governing the transmission of sound in such a room, see Music Hall.)

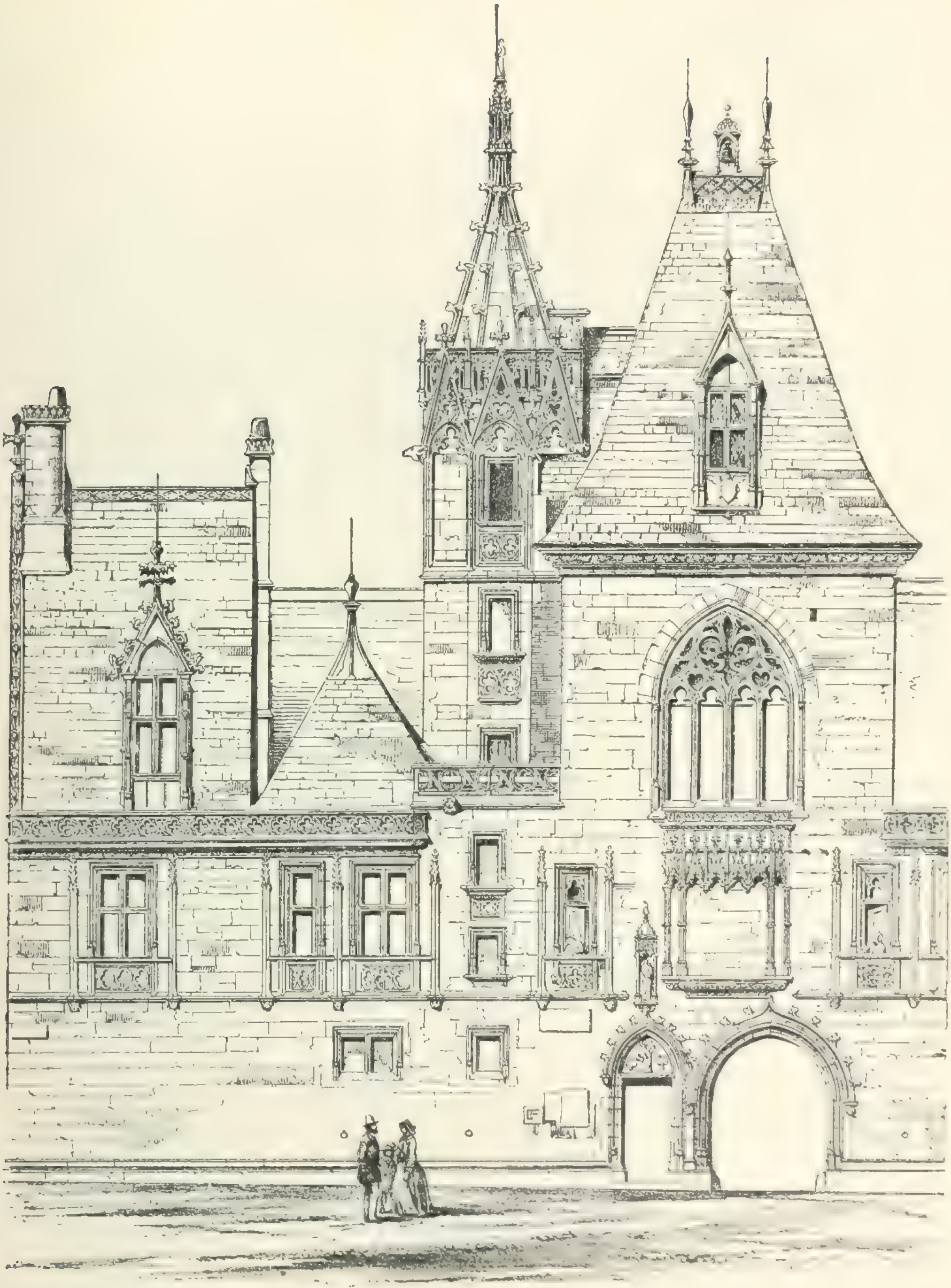
CONCH. A concave member; a half-cupola or a part usually less than half of a sphere. The term is less frequently applied to the semidome of an apse, and more frequently to the head of a niche or of a trompe or to a pendentive.

CONCIERGERIE. *A.* In French, the office or rooms of the concierge; that is to say, of the janitor or custodian of a large and important building.

B. A prison, attached to the *Palais de Justice* in Paris, and which has been celebrated in connection with different tragedies of past history, the most celebrated being the massacre of prisoners during the early weeks of the French Revolution.

CONCOURS. In French, a competitive contest of any kind, as a competition among architects, or an examination of students conducted by means of drawings, designs, or the like, which the students make unaided and which are judged by comparison with one another. Used in English, especially in the latter sense.

CONCRETE. A building material made by mixing small fragments of hard material with mortar, so as to form a kind of artificial stone. There are different ways of mixing, and also of applying it; thus, in good work, granite, trap rock, or other hard stone is broken into pieces with a given limit of size, as when it is



COMPOSITION: HOUSE OF JACQUES CŒUR, BOURGES. ELEVATION OF FRONT NEXT THE STREET.

[illegible] that every fragment shall pass through [illegible] 2 inches inside diameter (but this precaution is often very improperly dispensed with). So in putting the concrete into place; it is sometimes mixed on the spot, shovelled into place, rammed, and left to harden; but formerly many English engineers have required that it should be thrown from a height into the trench or box which is to receive it, a defective method generally abandoned. Concrete may be made in solid blocks, being rammed in a mould, and these may be used to build with even in the form of lintels, as, if made of good materials, it is capable of enduring a considerable transverse strain. It is most commonly used in the way of foundations by filling up trenches in the ground and so forming a level and permanent bed for the mason work above. Even in foundations laid upon solid rock, great use is made of concrete, by means of which the irregular broken surface left from the blasting or the pickaxe can be smoothed to a perfectly uniform bed capable of receiving the most carefully laid walling. (See Beton.) — R. S.

The concrete of to-day is made of broken stone or gravel, usually not more than 2½ inches in any dimension, with a mortar the composition of which varies with the purpose of the work. If the natural light-burned cements are used in concrete for foundations not under water, and for the backing or hearting of heavy walls, two parts of sand to one of cement and five parts of broken stone and gravel is sufficient. For subaqueous work, for foundations, for walls much exposed to the weather, Portland cement only should be used, which will bear more sand and consequently more of the hard material; two and a half to three parts of sand may be mixed with one part of cement and five or six parts of broken stone and gravel. They are mixed preferably by machinery; if mixed by hand, the mortar is spread upon a solid bed, the stone or gravel placed upon it, and the whole turned over until each stone is coated with mortar. It is then transported to its place in the work, levelled in layers of 6 to 8 inches, and rammed until the fluid mortar appears upon the surface. The finer kinds of concrete, made with very small materials carefully mixed and moulded, may be classed as artificial stone.

W. R. Hutton.

CONDITIVUM; CONDITORIUM. A Roman subterranean sepulchre for entire bodies in sarcophagi.

CONDUCTOR. In architecture, any material or device for the conveyance of a fluid or for the transmission of some form of energy, as heat, electricity. Specifically: —

A. A lightning conductor; any rod, wire, or the like serving the purpose of a lightning rod.

B. A pipe, generally vertical, for conveying rain water falling upon roofs to the ground, or into a drain. Usually called a leader.

— W. P. G.

CONDUIT. *A.* A channel or pipe for conveying water or other fluids.

B. A passage, underground or otherwise concealed, for secret communication.

C. A tube for protecting electric wires. (See Electrical Appliances.)

CONFESSIONAL. The place in the church where a priest sits to hear the private confessions of the faithful. In England anciently called the "shriving-seat," and before which the penitent knelt confessing in open church to the seated confessor, a custom still in use among the Greeks. In Western Christendom, in the sixteenth century, boxed confessionals were introduced and placed in a conspicuous part of the church, but this did not become general until the following century. There are now two forms in use: one a combination of a kneeling stool and a seat, separated from each other by an open screen; the other and more usual form is a box of three compartments — the central one is the seat of the priest, the others are the kneeling places for the penitents, and are divided from the central division by partitions in which there is a small window with a grating and shutter; the central compartment is provided with a door, as are often the side ones. The confessional is commonly placed against the wall of the church, or in a recess made to receive it, but always in plain sight of the congregation.

S. Carol. *Borrom. Instr. fabr., eccles. lib. II, c. XVIII*; Mallet, *D'Archéologie Religieuse*, Vol. II. (Paris, 1887).

— Caryl Coleman.

CONGÉ; CONGEE. A quarter round concave moulding, tangent to a vertical surface and succeeded by a fillet parallel to that surface. (See Apophyge for the congé applied to a shaft.)

CONGLOMERATE. Any rock made up of rounded pebbles, like a consolidated gravel, differing from sandstone only in the size of its particles. Siliceous conglomerates are sometimes used for building, and calcareous conglomerates for marbles. — G. P. M.

CONGRESSIONAL LIBRARY. (More properly, Library of Congress.) In Washington, D. C. A large building completed in 1897 for the library which had formerly been arranged in the Capitol. The architects were John L. Smithmeyer and Paul J. Pelz, and after 1892 Edward Pearce Casey was put in charge of the decorations, including the sculpture and mural paintings. These are peculiarly important; the building is much more richly adorned in these respects than any other existing in the United States.

CONRAD, prior of Canterbury.

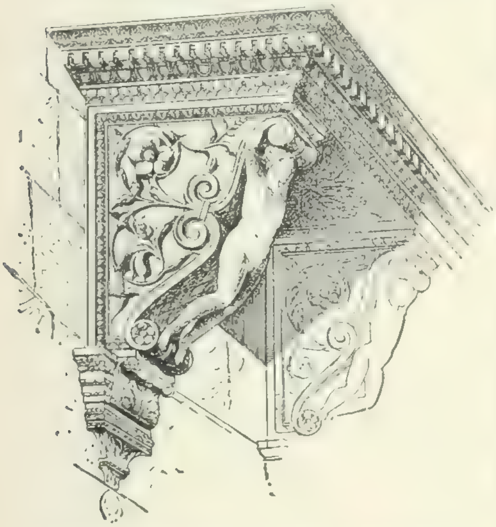
S. Anselm, Archbishop of Canterbury, is said to have spent nearly all his revenues in rebuilding and decorating the choir of Canterbury Cathedral. The superintendents of the work were the priors Ernulf and afterward Conrad. The "glorious choir of Conrad" is described by Gervase (see Gervase), quoted by Willis (op. cit.). This choir was burned in 1174.

Britton, *Cathedral Antiquities*; Willis, *Canterbury Cathedral*.

CONSERVATORY. *A.* A public building devoted to the cultivation of, and instruction in, any branch of art or science, especially the fine arts; as a conservatory of music.

B. A building devoted to the preservation and cultivation of delicate plants; a greenhouse. Common usage seems to justify the application of this word specifically to a glass house for plants attached to a mansion. (See Greenhouse.)

CONSOLE. A projecting, scroll-shaped member, usually understood as being a variety of corbel or bracket; but having always parallel, nearly plane sides. It is commonly altogether decorative in its purpose, as a scroll-shaped figure used to support a window head, a table top, or the like. The definition is generally taken as a bracket which has a height at least twice as great as its projection; and the term cantilever or modillion is supposed to be more appropriate for a bracket or corbel which projects more in proportion. But these definitions are all vague; and the console is usually an ornamental bracket whose sides are parallel and with those sides ornamented with scrolls. (See French term *corbeau*, under Corbel.) The term is also extended, sometimes, to mean a similar scroll-shaped member having its greatest horizontal dimension at the bottom, as if a reversed bracket, such as is commonly used to form a spreading base of a chambranle of classic type, or to form a buttress. (See Ancon; Modillion.)



Console: Cathedral of Como, Lombardy, Italy.

CONSTANT D'IVRY. (See Contant d'Ivry.)

CONSTRUCTION. *A.* The manner in which anything is composed or put together.

B. The act and the art of putting parts together to produce a whole.

C. (With the article) a completed piece of work of a somewhat elaborate kind; especially a building in the ordinary sense.

The art of construction is primarily a matter of empirical practice, a body of simple devices handed down by tradition and practised by each builder nearly as he has been taught in his apprentice days. A great deal of scientific investigation has been given, especially during the present century, to the principles of construction; and the result is a science of arched construction, a science of post and tie construction, a science of framing based on the combination of rigid triangles, a scientific treatment of each separate branch of the builder's art. These, though often used unconsciously by the practised builder, are still scientific in their nature, and they must always hereafter exercise control over all but the simplest processes of building. Thus, one may still build a wooden frame house, or span a river by a small bridge, without any knowledge of the science of construction; but in the future no builder will dare undertake a larger and more important task without a profound study of the scientific principles which control his work, or, in default of that, the assistance of a man of science, that is to say, of an engineer.

The most elaborately organized construction of past times is that of the Gothic churches of the thirteenth and fourteenth centuries, especially in central France and in the countries which take their inspiration directly from France; it is extremely difficult to ascertain how much truly scientific knowledge or study went to these structures, because, while mathematics was but little advanced in Europe, there was still a profound knowledge of the way in which different materials should be used, and this knowledge can hardly fail to have been pursued in a way which can be called scientific. The exact equilibrium of forces themselves in the elastic construction of Gothic vaults with their system of action and reaction, the taking up of one thrust by another, and the final throwing of all the thrusts of the structure upon flying buttresses, and the heavy buttress piers outside of the building, would seem to have required something more than mere rule of thumb for its universally successful application. Science, however, in the modern sense, cannot be said to have existed among a [illegible] builders who had not yet begun to use the Arabic numerals, to whom geometry was unknown except as to the properties of one or two simple figures, and who cannot have undertaken the most simple solution by means of trigonometry; to whom also the practice of experiment accurately observed and its result accurately recorded can hardly have been known.

Construction carries with it, and includes, the preparation and transportation of materials; and this art as practised by the Egyptians, the Greeks, and the Greco-Roman builders of Syria, has always excited the wonder of modern students. (See Transportation.)

(For construction in the proper sense, see Iron and Steel Construction; Masonry; Vault; Wood, Construction in; also Arch; Beam; Excavation; Foundation; Girder.) — R. S.

CONTANT, (CONSTANT) D'IVRY, PIERRE; architect; b. 1698; d. 1777.

Contant was born at Ivry-sur-Seine, near Paris. He was a pupil of the architect Nicolas Dulin and became a member of the *Académie de l'Architecture* in 1728. He was appointed *architecte du roi*, *contrôleur de l'Hôtel des Invalides* and *premier architecte* of the Duke of Orléans. April 3, 1764, he commenced the parish church of the Madeleine, Paris. His design bore no resemblance to the present structure. (For transformations of the Madeleine, see Couture, G. M., and Vignon, B.) Contant made extensive additions to the Palais Royal (Paris).

Lance; *Dictionnaire*; Ch. Lucas in *La Grande Encyclopédie*.

CONTINI, ANTONIO; architect.

Contini was a nephew of Giovanni da Ponte (see Giovanni da Ponte). He built the Bridge of Sighs between the Doges' palace and the prison in Venice.

Müntz, *Renaissance*; Gurlitt, *Geschichte des Barockstiles in Italien*.

CONTRACT. In the practice of architecture and building, an agreement between an owner or lessee who proposes to erect or alter a building, and a mechanic or an employer of mechanics for the completion of the building or of some part of it. Contracts are commonly made in England for the whole building, and the contractor employs his own masons, carpenters, roofers, and the like, having different gangs of workmen under different foremen. In the United States it has been rather more usual for the masonry to be put under contract by itself, the carpenter work by itself, etc.; except that subcontracts are very common, as when the mason "sublets" the stone-cutting, and even the setting of the cut stone, or the excavation. Where an architect is employed it is usual for the contract to recognize his control over the work, and to provide that payment shall be made by the employer only on the certificate of the architect, who then acts as superintendent.

The advantage of building by contract is that the employer knows in advance what his building will cost. This is of such supreme importance to most persons purposing to build — they being unaware of, or careless of, the difficulties in the way of excellent work, either practical or artistic, under the contract system — that they insist upon the making of contracts or assume it as a matter of course. The disadvantages, however, are very great. They are caused by the difficulty and uncertainty connected with adding extra work which is not in the contract, and may briefly be summarized as follows: —

(1) Practical requirements — especially the minor ones which are not, however, of slight importance — are never all foreseen. Inasmuch as every building differs from every other, the experience of one building does not perfectly meet the requirements of the next, and important details of plumbing, heating, ventilation, fittings, appurtenances, and the like are left out of the original contract from sheer inability to call to mind the necessity of each detail at the right moment. If one visits a newly built first-class house which is offered for sale, his first impulse will be — noting the elaborate care with which kitchen and laundry fittings have been supplied and placed, and the multiplicity of minor conveniences in connection with plumbing, heating, and their appurtenances — to say that this is not a house built from an architect's design and therefore by contract. The day's work system followed by the builder, who has put up this house at a venture for sale to the first comer, has enabled him to put in these conveniences as the work went on.

(2) Thoughtful and careful design can hardly be given to a building under contract because the whole structure, in our time so elaborate in its primary composition and so multifarious in its details, has to be in the mind of the designer in advance of the laying of the first stone, and because no man is competent to grasp such a vast problem. Every architect who has built a large building by day's work knows the great advantage which lies in the power to alter the minor details from time to time as the work progresses: to make a working drawing on the back of the board; to visit his building to-day and on returning to the office make a drawing for a pillar, a niche, a dado, or the like, not in advance of the foundation, but after some familiar acquaintance formed with the building in its main lines.

(3) It is probable that there will be no great improvement in the artistic results of architects' practice until the commission system is done away with, and until architects are paid by salary, or by lump sum. This improvement can hardly be made, however, under the contract system. The two seem to belong together; the architect, being recognized in the

contract as an essential third party to that contract, is naturally paid by a percentage on the amount of money represented in the contract.

These considerations seem so important to many of those who have strongly at heart a return of architectural practice to older and wiser methods, that it has grown to be a common opinion that the abolition of the contract system is the first step that should be taken. (See Builder; Estimating; Superintendent.) — R. S.

CONTRACTOR. One who enters into a contract; especially, in building, the boss mechanic or master mechanic, who agrees to furnish materials and work for a piece of masonry, ironwork, or the like; and this according to a contract based upon the drawings and specifications of an architect or engineer. (See the discussion of the contractor's place and duty under Superintendence.)

CONTRERAS, JOSÉ. (See Contreras, Rafael.)

CONTRERAS, DON MARIANO. (See Contreras, Rafael.)

CONTRERAS, RAFAEL; architect; b. Sept. 23, 1824; d. March 29, 1890.

His father, Don José Contreras, architect of the city of Granada (Spain), had charge of the Alhambra palace near Granada. Rafael succeeded him, and Nov. 23, 1847, was commissioned to restore the palace. He has been succeeded by his son, Don Mariano Contreras. Rafael published *Estudio descriptivo de los monumentos arabes de Granada, Sevilla y Cordoba*, etc. (3d ed. 1885, 1 vol., 8vo); *Recuerdos de la Dominacion de los Arabes en España* (1882), etc.

Royal Institute of British Architects, Journal, Jan. 22, 1891, p. 141.

CONTUCCI, ANDREA. (See Sansovino, Andrea.)

CONVENT. *A.* A religious community; very often a nunnery as distinguished from a community of monks, but this restriction has no authority.

B. A group of buildings occupied by or intended for such a community. (See Monastic Architecture.)

CONVENTUAL. Belonging to a convent, monastery, or nunnery, as a conventual church, conventual buildings; of the style and character of a convent. The term monastic is preferable in referring to the architectural style of the period when monasticism was at its highest development, and, indeed, in speaking of the architectural style of conventual buildings.

CONVENTUAL ARCHITECTURE. Same as Monastic Architecture.

CONVERSATION ROOM. The general meeting and sitting room of a club house; generally the largest and most important room and used for general social intercourse. Thus distinguished from other apartments of special purpose where conversation is usually restricted. (See Club House.)

COOLEY, THOMAS; architect; b. 1740; d. 1784.

Cooley won first premium for a design for the Royal Exchange, Dublin (Ireland), in 1769, and completed that building in 1779. He built several other public buildings in Dublin.

Arch. Pub. Soc. Dictionary.

COP. *A.* In the north of England the long mass of earth thrown up in excavating a ditch, sometimes left as a fence and sometimes planted at the top with a hedge; probably so called from its resemblance to a coping.

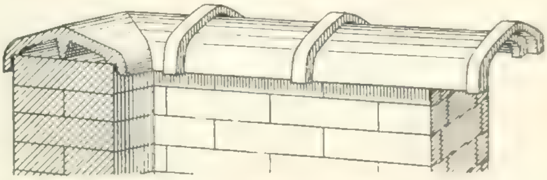
B. In castellated battlements, any one of the solid portions between two embrasures; a merlon (rare).

COPE (v. int.). To overhang with a downward slope, as the soffit of a corona. Generally, cope over.

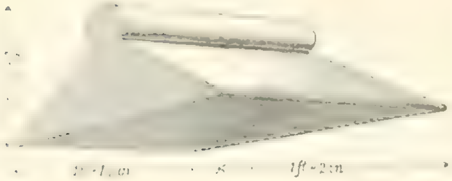
COPE (v. t.). *A.* To cover or finish with a coping.

B. To join — as two intersecting, correspondingly moulded members — by shaping the end or butt of one piece to form a surface which shall be the reverse of, and fit closely against, the side of the other, so that the mouldings appear to mitre or return. Generally, with *in* or *together*. Hence, to cut out or shape so as to cope.

COPING. Material or a member used to form a capping or finish at the top of a wall, pier, or the like to protect it by throwing off the water on one or both sides. In some cases a level coping suffices, if of stones or tiles wider than the walls; usually it is formed with a pitch one way (see Feather Edge) or from the centre both ways (see Saddlebacked). The mediæval architects gave great attention to their copings, especially on gable walls, which were commonly carried above the roof, and on balustrades and parapets, finishing them usually with a roll or astragal on top, a slope each way, sometimes in steps, and a throating or grooving on the under edge where it projected beyond the wall. Wooden or metal copings are employed over fences and in cheap construction. (For the many forms assumed by the coping in gables of the Elizabethan and related styles, see Gable; Fractable.) — R. S.



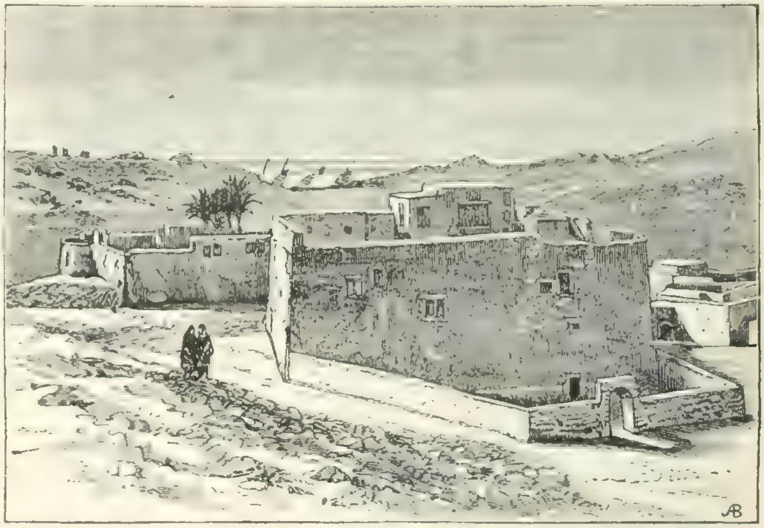
Coping of Terra Cotta.



Coping Stone of a Common Mediæval Type.

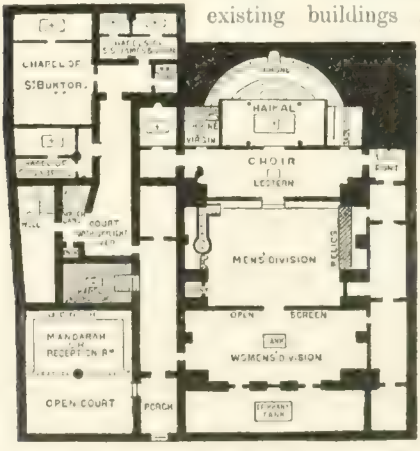
Parallel Coping. A coping which is not sloped on top to shed the water, but flat; it should consequently only be used on inclined surfaces, such as gables, etc., or in places not exposed to the rain. (See Coping, above.)

COPING STONE. A stone for forming a coping; a capstone. Also Copestone.



Coptic: Dair Bablûn (in the Foreground) and Dair Tadrus (beyond), enclosing each a Church.

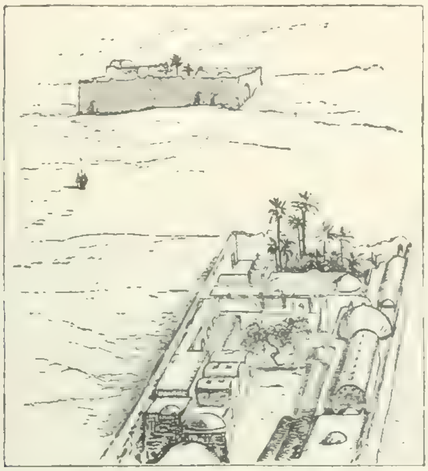
COPTIC ARCHITECTURE. That of the Copts or natives of Egypt; especially the native Christians of Egypt, considered as having very little foreign blood and as being little influenced by the Mohammedan conquest or by artistic influences later than those of the Byzantine Empire. Many church buildings exist, scattered throughout Egypt; in the towns, in the monasteries which remain undisturbed, surrounded by high walls and tolerably safe from attack, and in lonely places on the edge of the desert, as in the celebrated Natrun valley lying in the desert west of Cairo. The earliest existing buildings are generally of the basilican type, having wooden roofs and generally a division into nave and aisles with a transept near the east end or at least a transverse alley, passage, or nave which takes the place of a transept. Orientation, with the sanctuary at the east end and the principal entrance at the west, seems to have been the rule from the beginning. It was evidently the original scheme, in most cases, to provide a row of columns on three sides of the nave; that is to say, to build with an aisle crossing the west end of the church and connecting with the long aisles of the northern and southern sides. The columns were frequently taken from older buildings. The wall above the columns was generally carried on a horizontal lintel course, treated as an architrave; but sometimes a discharging arch was built above it. At a later time, when some change in the liturgical arrangements had taken place, the space between the columns at the west end, and continuously from north wall to south wall, was walled up so that a full narthex was formed.



A. J. B. GROUND PLAN

Coptic Church of Abu-'s-Sifain, and the Adjoining Chapels.

At an early time the barrel vault was introduced, and perhaps the earliest roofs of this form in Christian architecture are to be found in Egypt. The cupola, on the other hand, although Oriental in its origin, was unquestionably of later introduction into Egypt, and was indeed a direct loan from the Byzantine style. It argues great vitality in the Coptic architecture proper that, in the sixth century, it did not take over the Byzantine style in its completeness. This, however, it certainly did not; on the contrary the cruciform plan was always rare in Egypt; and in like manner a central and comparatively large cupola, dominating the whole church, is almost unknown. The decoration of the churches with marbles, mosaic, and sculptured capitals and slabs was probably rare in Egypt; but painting in brilliant colours and with much gilding was the rule; and many traces of it remain.



Coptic Convent Dair-as-Súriâm, and Neighbouring Convent of Anba Bishoi (in the Background).

Towers are uncommon, probably because the use of bells is discouraged or even forbidden by the Mohammedan rulers of the land. On the other hand, it is stated by A. J. Butler that bell towers and even bells exist in the Natrun valley; but these he states to be only two stories high, as a general thing, and it does not appear that they have architectural character. All parts of the buildings are covered, in most cases, with flat roofs of masonry, often having solid parapets.

But little study has been given to these buildings, which are steadily disappearing. The studies of Alfred J. Butler, published in 1884 under the title, *The Ancient Coptic Churches of Egypt*, serve as an introduction to the subject.

See also Denon, *Voyages dans la Basse et la Haute Égypte;* and the great work of the French government, *Description de l'Égypte*.

— R. S.

COQUEAU (COQUEREAU), JACQUES; architect.

Coqueau probably came from Amboise (France). About 1538 he succeeded Pierre Nepveu (see Nepveu, P.) as *maître des œuvres* of the châteaux of Chambord and Blois. He assumes this title in a letter written in 1541, which has been preserved. In 1556–1557 he was associated with Philibert de l'Orme (see De l'Orme, P.) in the inspection of the works at the bridge and gallery of the châteaux of Chenonceau. He probably continued the construction of the right wing of the chateau of Blois begun under François I.

Berty, *La Renaissance Monumentale en France*; Storelli, *Les Châteaux du Blésois*; Chevalier, *Archives royales de Chenonceau*; De la Saussaye, *Château de Chambord*; Bauchal, *Dictionnaire*.

COQUILLAGE. A representation or suggestion of the forms of seashells and the like, as in decorative carving.

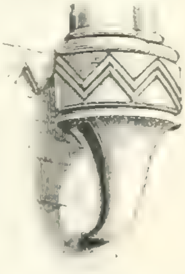
COQUINA. A shell limestone, but slightly consolidated. Example, the shell limestone used in the construction of the old fortifications at Saint Augustine, Florida. — G. P. M.

CORA (Kora). Literally a maiden; applied by Greek authors to a draped female figure used in architecture. (Compare Canephora; Caryatid.)

CORAL ROCK. A limestone composed mainly of coral fragments. — G. P. M.

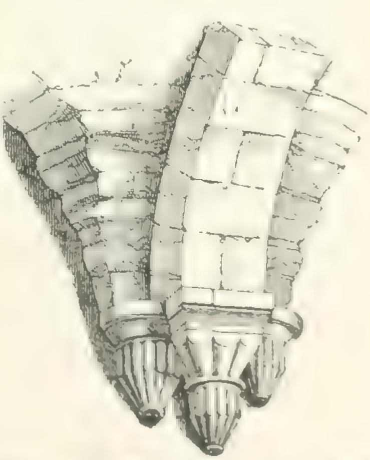
CORBEILLE. In French, a basket. Employed in English in the eighteenth century to designate any basketlike architectural member, especially capitals resembling baskets either in form or decoration; now obsolete. (Written also *corbeil* and sometimes confused with *corbel*.)

CORBEL. A bracket of that form which is best fitted to ordinary conditions of cut stone or of other masonry; in French, the corresponding term *corbeau* is limited to a bracket having, particularly, two opposite vertical sides, as distinguished from the *cul de lampe*, which has a generally pyramidal or conical shape. In this limited sense a modillion is a corbel; but the term "corbel" is used more commonly for mediæval and outlying styles of architecture.



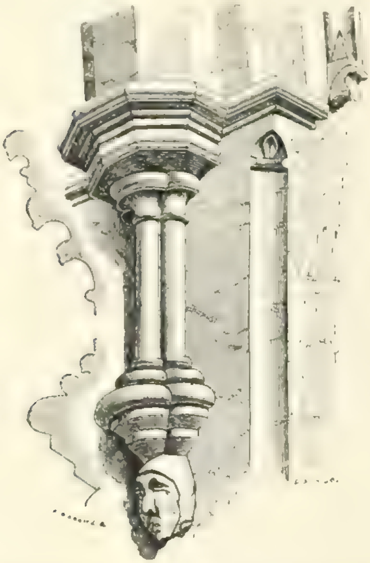
Corbel in Broadwater Church, Sussex.

In English books the term has a special application to those wall brackets of many forms which in Gothic architecture serve as starting places for vaulting-ribs. Sometimes these are



Corbel at Kirkstall Abbey, 1150.

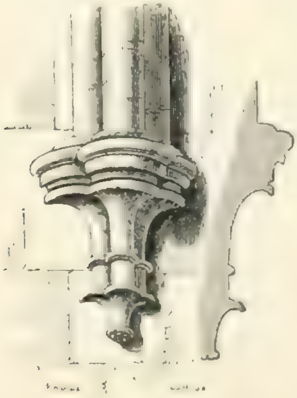
simple *culs de lampe*; but sometimes they are dwarf vaulting shafts, with caps and bases.
— R. S.



Corbel at Polebrook, Northamptonshire, c. 1200.

CORBEL (v.). To build outward, by projecting successive courses of masonry beyond those below. Generally, to corbel out.

CORBEL ARCH. A span of stonework constructed by regularly advancing successive courses, till the top ones nearly meet, when a long capstone is laid across to complete the work. This was the nearest approach to the true arch commonly used by most early civilizations, the Etruscans being almost the only exception. It was used by the Maya and kindred tribes. In one example, the corbel stones at the back are cut in L shape. The only other arch used in America was that seen in the snow dome of the Eskimo. (See Iglugeak: Mexico, Architecture of, Part I.: Treasury of Atreus.) (Cut, col. 677.) — F. S. D.

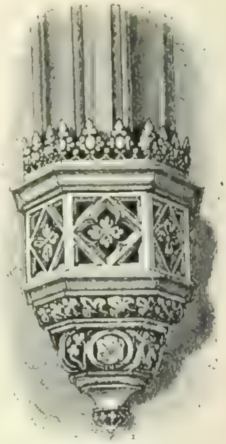


Corbel: Lincoln Cathedral.

CORBEL COURSE. In a masonry structure a course in which corbels are set; either at intervals for a corbel table, or continuously to form a heavy projecting moulding.

CORBELLING. Any system or aggregate of corbels, or the act or operation of building corbels in masonry. (Compare Counterpoise.) (Cuts, cols. 677, 678.)

CORBEL MOULD. A pattern for corbelling, as in brickwork or plaster; usually, in practice, shaped out of a piece of board or thin metal, and giving the mouldings, etc., in reverse or concave section.

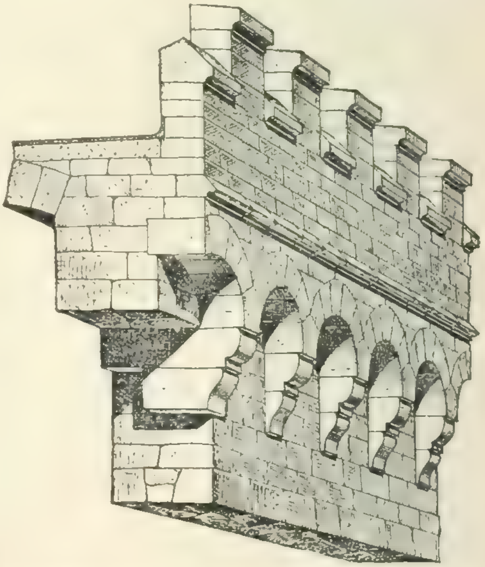


Corbel in Hall of Christ Church, Oxford, c. 1529.

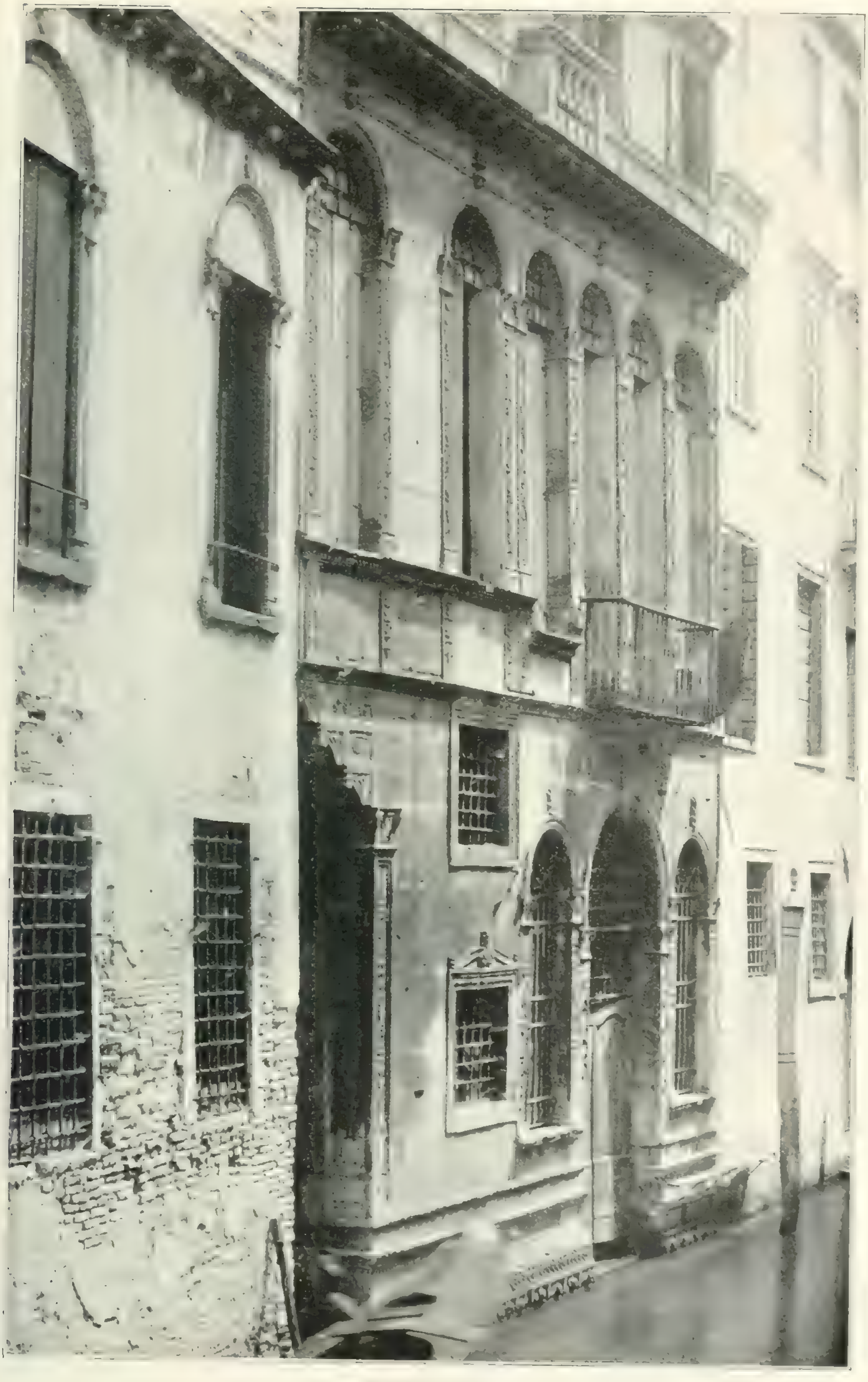
CORBEL PIECE. Any piece serving the general purpose of a corbel; *i.e.*, an overhanging support. The term is not of precise application, and appears to be restricted mainly to a light member of wood, such as a lookout.

CORBEL STEP. Same as Crow Step; apparently a mistaken form of the variant Corbie Step.

CORBEL TABLE. A projecting course of masonry carried on a row of corbels, whether with or without connecting arches. Strictly speaking, the modillions and corona of a Corin-

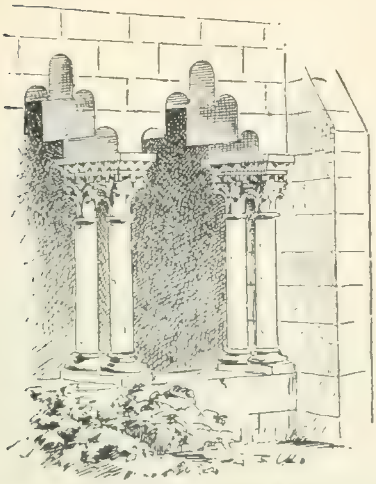


Corbels carrying a Battlemented Parapet.



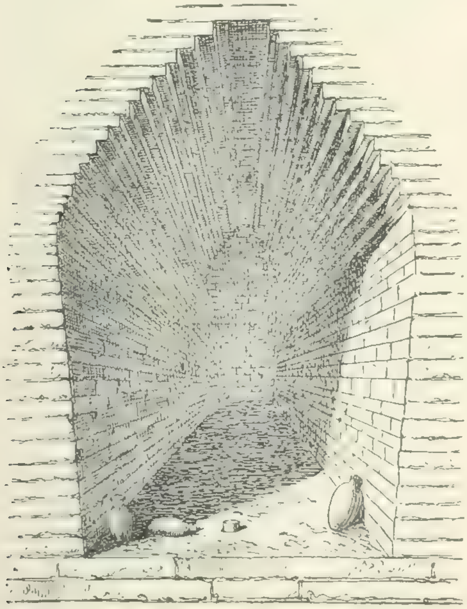
CORBELLING

That carrying a part of the front of a house on the Rio della Fava, Venice. A narrow *calle* leads to a flight of steps at the water's edge, and the upper floor of the house is carried over this. The building is used as a furniture shop; it has never been repaired, nor, as it seems, altered in any way, except by the addition of an upper story. It is one of the most attractive houses left us from the Renaissance, dating probably from about 1480. It is noticeable that the pier between the doorway and each arched opening which flanks it is made up of two pilasters set at different heights.



Corbelling in Cloister of S. Pablo in Barcelona.

thian cornice are a corbel table, but the term is usually understood to refer to mediæval exam-



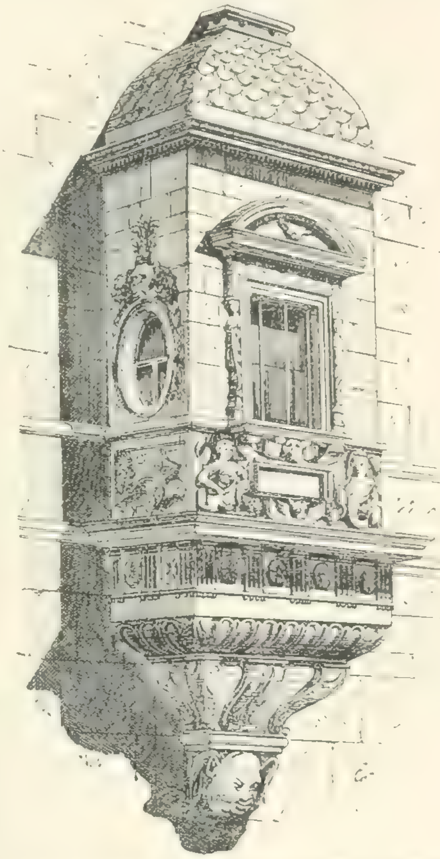
Corbel Arch in the Necropolis of Mougheir, Lower Chaldea.

ples. The Italians treated this feature with especial elegance; the cornice of the *Loggia dei Lanzi* at Florence (cir. 1335) is one of the best-known examples. (See Corbel Course.)

CORBEL VAULT. A vault made by corbelled courses, as of stone (see Corbel Arch). It was used by the Mycenæan builders, as in the so called "Treasury

of Atreus," and, freely, by the Mayas of Yucatan, who, in their buildings, had corbelled ceilings built on a support of packed earth, which was afterward removed. — F. S. D.

CORBEL WORK. In Moorish and other Mohammedan styles, same as Stalactite Work.

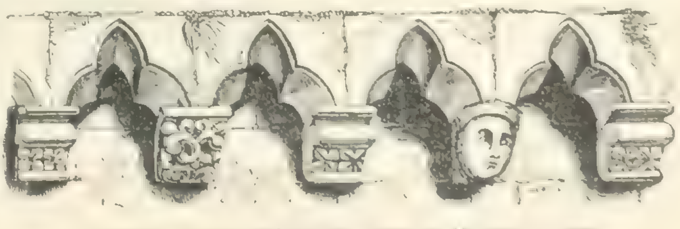


Corbelling of a Bay Window in Dijon, France.

CORBIE, PIERRE DE; architect (*maître d'œuvre*).

He is mentioned in the *Sketch-book* of Wilars de Honecort (see Wilars de Honecort) as Petrus de Corbeis. He was associated with Wilars in making a design for the choir of the cathedral of Rheims (Marne, France) in 1215 and in the construction of the cathedral of Cambrai (1230–1243).

Lassus, *A*[illegible] *de Villard de H*[illegible]; Bauchal, *D*[illegible]



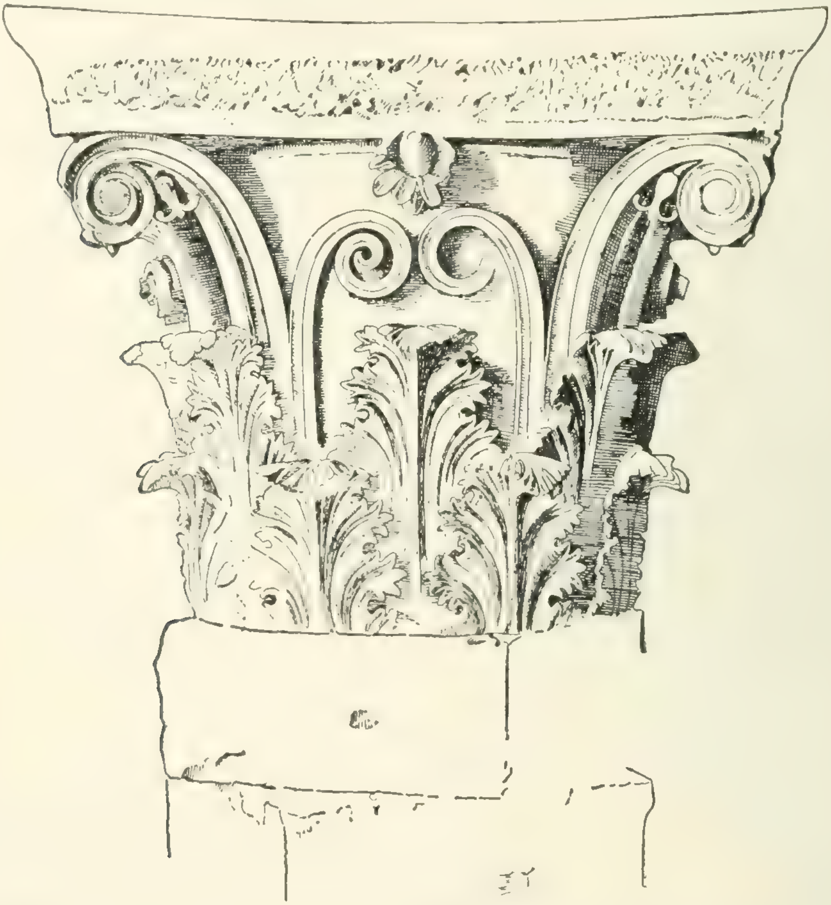
Corbel Table at Romsey Ch[illegible], Hants, c. [illegible]

CORBIE STEP. Same as Crow Step; the Scotch term, gables of this sort being common in Scottish architecture previous to the seventeenth century.

CORDON. A string course or belt course. It is also applied to the slightly projecting stones or risers at the lower edge of each step of a ramp or *cordoni* or *scala cordonata*.

CORDONATA, CORDONI. (See Scala.)

CORE. *A.* In general, the central or axial interior portion of an object or structure, usually the least valuable part of its substance when the latter is not homogeneous throughout. Thus, in particular it signifies: (1) the rough masonry of a pillar or column to be finished by a sheathing or plastering of finer material; (2) the rough brickwork or masonry of a plaster cornice to be finished in stucco; (3) the rubble or concrete filling between the brick or ashlar faces of a masonry wall built after the Roman fashion.



CORINTHIAN CAPITAL, APPARENTLY INTENDED FOR THE THOLOS AT EPIDAURUS; C. 300 B.C.

B. The mould which forms the hollow interior of a metal or other casting, as of a cast-iron column, or bronze statue. (See Cast Iron; Foundry.)

C. In British usage, refractory lumps in chalk, or in lime made from chalk.

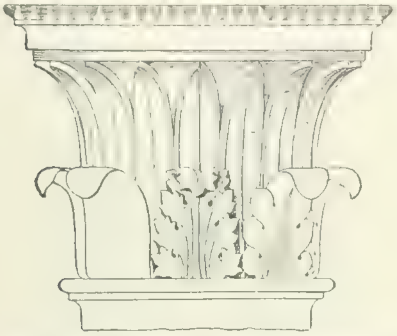
D. A continuous cylindrical mass which is cut out of the strata of earth and rock in boring, and which is retained by the hollow shaft of the drill. Such cores are preserved as records of the material existing at the successive depths. — A. D. F. H.

COREA, ARCHITECTURE OF. (See Korea.)

CORING. *A.* The operation of clearing out the rubbish from the flues of a building upon its completion (English usage).

B. The operation of removing the core from a casting or other object.

CORINTHIAN ORDER. One of the five orders recognized by the Italian architects of the sixteenth century and described by the writers of that time. It is one of the three orders used by the Greeks, but its origin was late in the independent development of Greek architecture, and there are only a very few monuments of pre-Roman time in which it is known to have existed. Of these the most important is the circular building at Epidaurus (see Tholos). The little building in Athens known as the Choragic Monument of Lysicrates is another instance. This order was adopted by the Romans of the Empire as their favourite one for elaborate work, and in some of their monuments is treated with great beauty, even the buildings erected far away from the centre of the empire retaining great charm of elaboration, as in Palmyra and Baalbek, in the palace at Spalato, the Maison Carrée at Nîmes, and, especially, at Athens in the temple of Olympian Zeus, which was finished, and probably entirely built, under Hadrian. — R. S.



Corinthian Capital of Simplest Type.

CORMONT, REYNAUD, or **REGNAULT, DE**; architect.

Reynaud was a son of Thomas de Cormont (see Cormont, T. de). In 1228 he succeeded his father as *maître d'œuvre* of the cathedral of Amiens (France). Reynaud built the great vaults according to the plans of Robert de Luzarches (see Luzarches, R. de), probably also the choir, the *Chapelle de la Vierge*, the central window of the apse (1269), the northern arm of the transept with its rose window, and commenced the southern arm, which was not finished until 1296. His central tower was burned in 1527 and rebuilt in 1529.

Goze, *Cathédrale d'Amiens*; Gilbert, *Cathédrale de Notre-Dame d'Amiens*; Gonse, *L'Art Gothique*; Bauchal, *Dictionnaire*.

CORMONT, THOMAS DE; architect; d. 1228.

Thomas de Cormont assisted Robert de Luzarches (see Luzarches, R. de) at the cathedral of Amiens (Somme, France), and succeeded him as architect (*maître d'œuvre*) in 1223. He continued the work according to the plans of Robert de Luzarches and carried the nave up to the springing of the great vaults. He was assisted and succeeded by his son Reynaud de Cormont (see Cormont, R. de).

Gilbert, *Cathédrale de Notre-Dame d'Amiens*; Goze, *Cathédrale d'Amiens*; Bauchal, *Dictionnaire*.

CORN CRIB. In the United States, a building for the storage of corn, and the like. In its characteristic form, its sides are constructed of slats, set with open spaces between for the circulation of air to dry the corn; and it is raised above the ground on posts with projecting caps of sheet metal to guard against the entrance of vermin. Commonly, the sides slope outward toward the top, as some protection against the weather.

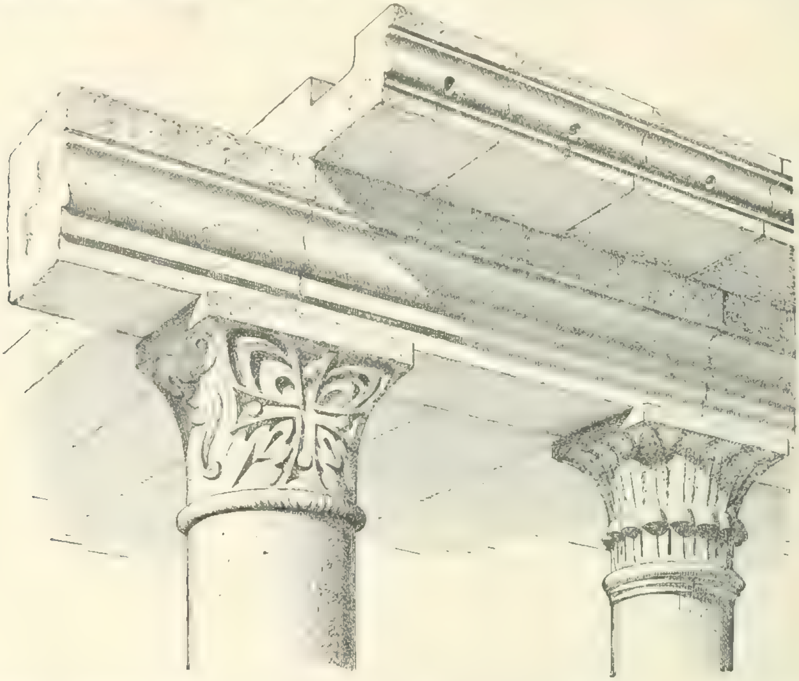
CORNERSTONE. A carefully prepared and dressed stone which is put in place with certain ceremonies on a fixed day soon after the beginning of an important building. It is usual to select a prominent part of the building, such as one of its corners, and also to carry up the foundation walls to a little distance above the ground level of the site, in order that the stone, once laid by the officiant, may remain in place permanently. It is also common to prepare a small cavity in the stone to receive certain documents, as a description of the undertaking, a list of its promoters, a few newspapers of the day, some current coins, or other things, which are thus handed down to an uncertain posterity. Anciently, a stone of the actual foundation was treated in this way, and the term Foundation Stone (A. P. S.) was used to describe it. — R. S.

CORNICE. The crowning member of a wall; or part of a wall; as a coping or water table treated architecturally. It has several special meanings.

A. In the classical entablature, the uppermost of its three principal members. It may crown a colonnade, a dado or basement wall, a porch, or even a purely ornamental feature, like the casing of a window. In buildings of classical design having more than one story, a cornice crowns the whole wall, and is proportioned rather to the height of that wall than to the height of the uppermost order if the building is of columnar architecture. In this sense the wall cornice has been said to have been borrowed from the order.

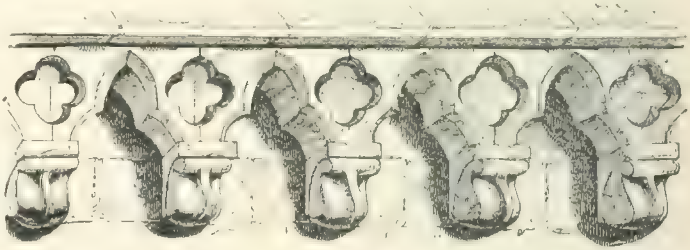
B. In architecture other than Greco-Roman and its imitations, the uppermost feature of a wall of masonry. Thus, the cornice of many Romanesque churches consists of a slab of stone projecting a few inches from the face of a wall, and supported, or apparently supported, where it overhangs, by corbels. Such a cornice may or may not carry a gutter. In some cases a row of small arches (a blind arcade) is formed under the top of the wall, and seems to carry the projecting stone. In the fully developed Gothic style the cornice generally consists of three members: first and lowest, a sculptured band; second, a drip moulding of considerable projection, the hollow beneath which is apt to be dwelt upon as forming an effective line of shadow; third, the steeply inclined weathering above, which is continued either to the gutter or is carried up so high as to form the face of the gutter cut in the stone behind it, or which carries a parapet of some sort. In wooden buildings there is confusion between *B* and *C*.

C. So much of the roof as projects beyond the face of the wall and affords shelter to the uppermost windows, besides giving shadow. It is the eaves treated in a decorative way.

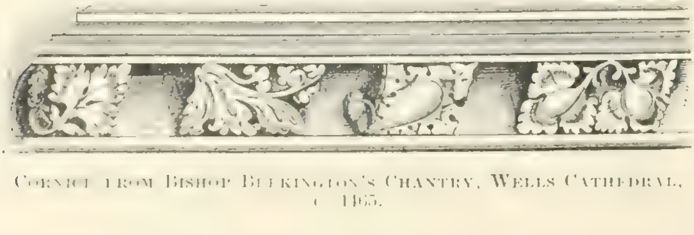


Cornice of a House of the 6th Century at Refadi, Syria; formed by the Projection of the Roof Slabs beyond the Entablature.

B is often called Wall Cornice (see also Cornicione). *C* is called also Roof Cornice. It is to be observed that when the uppermost courses of the main wall have no projection, or very little, it is common to say that the building has no cornice. Thus, the Ducal Palace of Venice has on its two principal fronts a course of marble decorated with a cove, a fillet, and a bead, but no more than four courses of brick in total height and having no more than 7 inches projection, although at least 85 feet above the pavement of the square; but this slight coping



Cornice from Warmington Church, Northamptonshire, c. 1250.



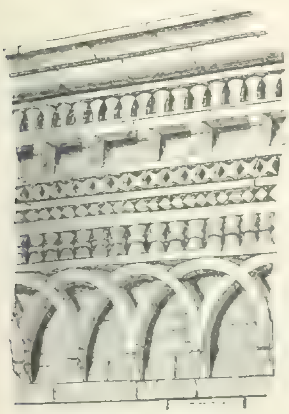
Cornice from Bishop Bekington's Chantry, Wells Cathedral, c. 1465.

carries a series of battlement-like upright ornaments of marble 7 feet high. In some high modern buildings with flat roofs, the cornice has been treated in a similar manner, and a parapet replaces its projection so far as architectural effect is concerned. (See Parapet.)

By extension, the term applies to a similar decorative member of whatever material, similarly placed, as at the top of a piece of furniture, of an interior wall or partition, or the like. Thus, cornices in the interiors of houses are usually formed of a series of plaster mouldings.

D. A piece of light woodwork, embossed metal, or the like, which is set horizontally at the top of a window casing within, either to conceal the rod and rings which carry the curtains, or to form a lambrequin as part of the upholstery, or to give emphasis to the height of the window. In this sense, the term is allied with the Italian use of the same word for a frame, as of a picture, a bas-relief, or the like, from which usage arises the frequent misunderstanding in descriptions of Italian interiors, the mountings and settings of pictures, or the like.

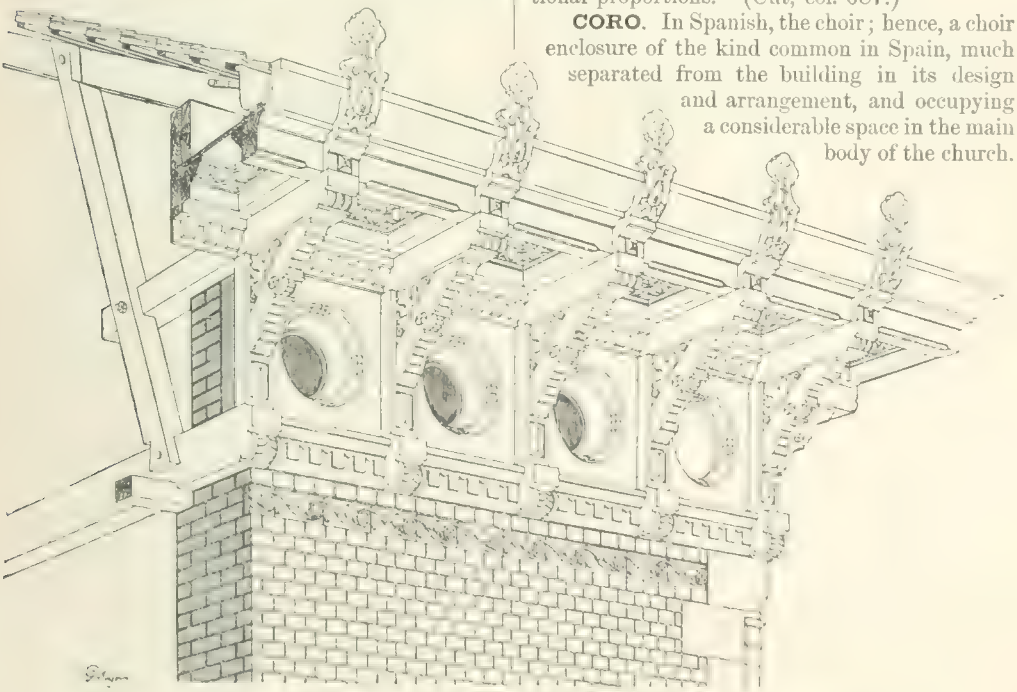
— R. S.



Cornice, S. Francesco, Brescia, Italy.

Block Cornice. In neoclassic architecture, a wall cornice produced by a simplification of the classic entablature. Modillions of some sort, usually very plain, carry a cornice proper of slight projection, and rest upon a simple bed mould. The term is used loosely for any very plain wall cornice.

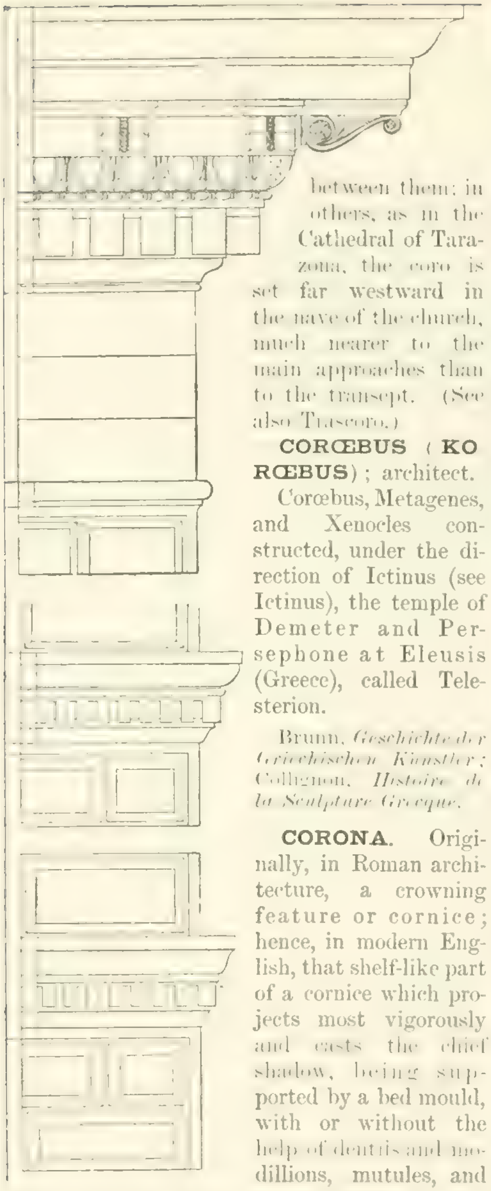
CORNICE HOOK. A hook for hanging pictures from the cornice or picture moulding of a room; a picture hook. It is usually of brass, and of a double curvature, the upper curve fitting over the top of the moulding on which it is to be hung.



Cornice formed by the Ornamental Treatment of the Roof Framing.

CORNICIONE. In Italian buildings of the Renaissance, and later styles, a wall cornice (see Cornice), so proportioned as to accommodate itself to the whole height of the wall and the whole mass of the building. The supposition is that each story has its own cornice, or at least that a number of string courses, each treated like a classical entablature and each having its own cornice, will have been built into the wall below: while the final or uppermost projecting member is proportioned, not to one story, but as to an imaginary order (of columns or pilasters) which would have had the whole height of the wall. Among the most effective *cornicioni* are those of the Palazzo Strozzi and the Palazzo Riccardi in Florence. In some cases, as in the admirable library of S. Mark's in Venice, the uppermost story has an entablature greatly enlarged from its due traditional proportion so as to conform to the whole height of the building, and thus the cornice of that second order becomes a cornicione. In later work, as of the Classicismo in Italy and of the seventeenth century in Northern Europe, the cornicione disappears; for either the colossal order reaches from basement to roof and has its own entablature, or else each story is treated by itself as an order and the uppermost entablature is hardly enlarged beyond its traditional proportions. (Cut, col. 687.)

CORO. In Spanish, the choir; hence, a choir enclosure of the kind common in Spain, much separated from the building in its design and arrangement, and occupying a considerable space in the main body of the church. In some cases, as at Barcelona and Tarragona, the reserved part of the church is divided into two parts, the coro, or choir, and the capilla mayor, or sanctuary, with a considerable space



CORNICIONE FROM THE PALAZZO STROZZI, FLORENCE, ITALY.

between them: in others, as in the Cathedral of Tarazona, the coro is set far westward in the nave of the church, much nearer to the main approaches than to the transept. (See also Trascoro.)

CORŒBUS (**KORŒBUS**); architect.

Corœbus, Metagenes, and Xenocles constructed, under the direction of Ictinus (see Ictinus), the temple of Demeter and Persephone at Eleusis (Greece), called Telesterion.

Brunn, *Geschichte der Griechischen Künstler*; Collignon, *Histoire de la Sculpture Grecque*.

CORONA. Originally, in Roman architecture, a crowning feature or cornice; hence, in modern English, that shelf-like part of a cornice which projects most vigorously and casts the chief shadow, being supported by a bed mould, with or without the help of dentils and modillions, mutules, and cantilevers, and crowned by the cymatium or crown moulding. It is the most important member of the cornice, all others being subordinate to it; its absence from most Gothic wall crownings is the most striking difference between the Gothic and classic systems of wall crowning. It is the elaborated form of the simple flat coping. Its under surface is often hollowed or channelled with a canal or throating. (See Cornice.)

— A. D. F. H.

CORONA LUCIS. A circle or hoop of lights for a church, whether suspended, or supported on a stand. A number of noted mediæval examples are still preserved in Europe; among them that of Aix la-Chapelle is perhaps the most ancient. Modern examples are fitted with burners for oil or gas, or with electric lamps.

CORONET. In English works, a pedimental or other decoration wrought in relief on a wall above a window or door. In examples of English and German Renaissance, they are often scroll patterns in flat relief, with an approximately triangular outline; in the French style of Francis I. they resemble steep pediments, often flanked by candelabra.

CORPORATION STOP. The connecting ferrule and shut-off between a street water, or gas, main and the house service pipe. It is also called the tap, and its insertion "tapping the main." — W. P. G.

CORPS DE LOGIS. *A.* The main part of a large dwelling, and, by extension, of any building, as distinguished from its wings or other subordinate parts.

B. A detached, or nearly detached residential pavilion. In this sense, not commonly used in English.

CORPSE GATE. (See Lich Gate.)

CORPS LÉGISLATIF. (See Palais Bourbon.)

CORREGGIO, ANTONIO ALLEGRI; mural painter of the highest rank; b. about 1494; d. March 5, 1534.

His work at Parma will be accepted by many good judges as the most admirable decorative painting in Europe.

Corrado Ricci, *Antonio Allegri da Correggio*; Madame Mignaty, *Le Corrège*; L. Fagan, *The Works of Correggio at Parma*; and in the General Bibliography, *Carlo d'Arco, Delle Arti e degli Artefici di Mantova*; Vasari; Nagler; Bryan; Scribner's *Cyclopædia*.

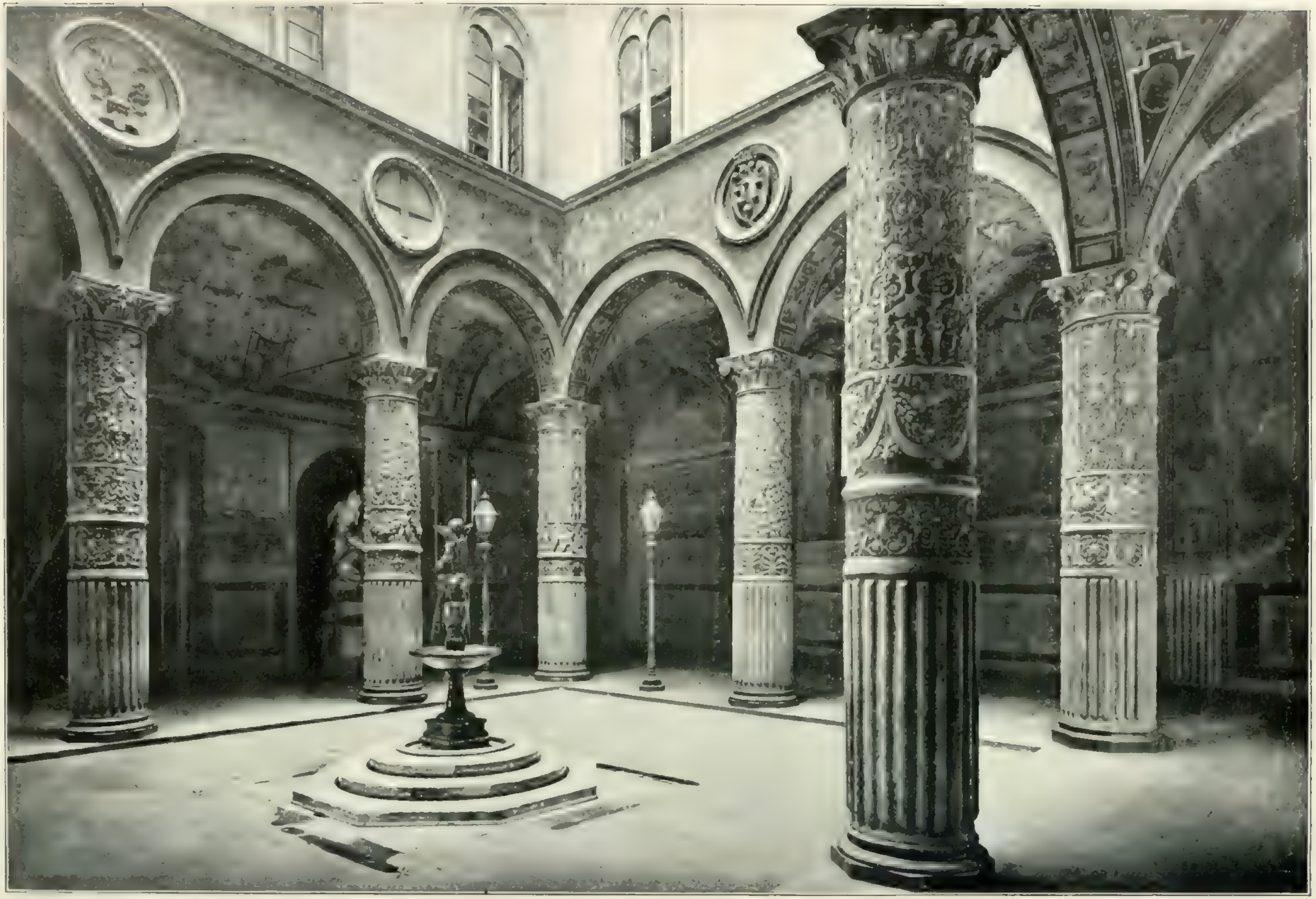
CORRIDOR. A passageway in a building, usually one of some size and importance, or belonging to a building of architectural pretensions.

CORRIDOR OF THE PITTI PALACE (the term being used for a separate gallery in imitation of the Italian phrase). An enclosed and covered passageway leading from the Pitti to the Palazzo Vecchio, a distance of about 700 metres; carried above buildings and across the Ponte Vecchio as a second story. (Compare next title.) It now forms part of the art galleries of the Uffizi.

CORRIDOR OF THE VATICAN (or of Castel S. Angelo or of Pope Alexander VI.). An enclosed and covered passage, carried from the palace to the fortress above the roofs of houses, etc. It is not open to the public.

CORROSION. The process of gradual decomposition or wearing away by chemical action, as by the action of water on iron, producing rust. Differing from disintegration, which is the result of mechanical action. In practice, the term is generally used only in the case of metals, decay being the usual term in the case of stone or wood.

PLATE XXIV

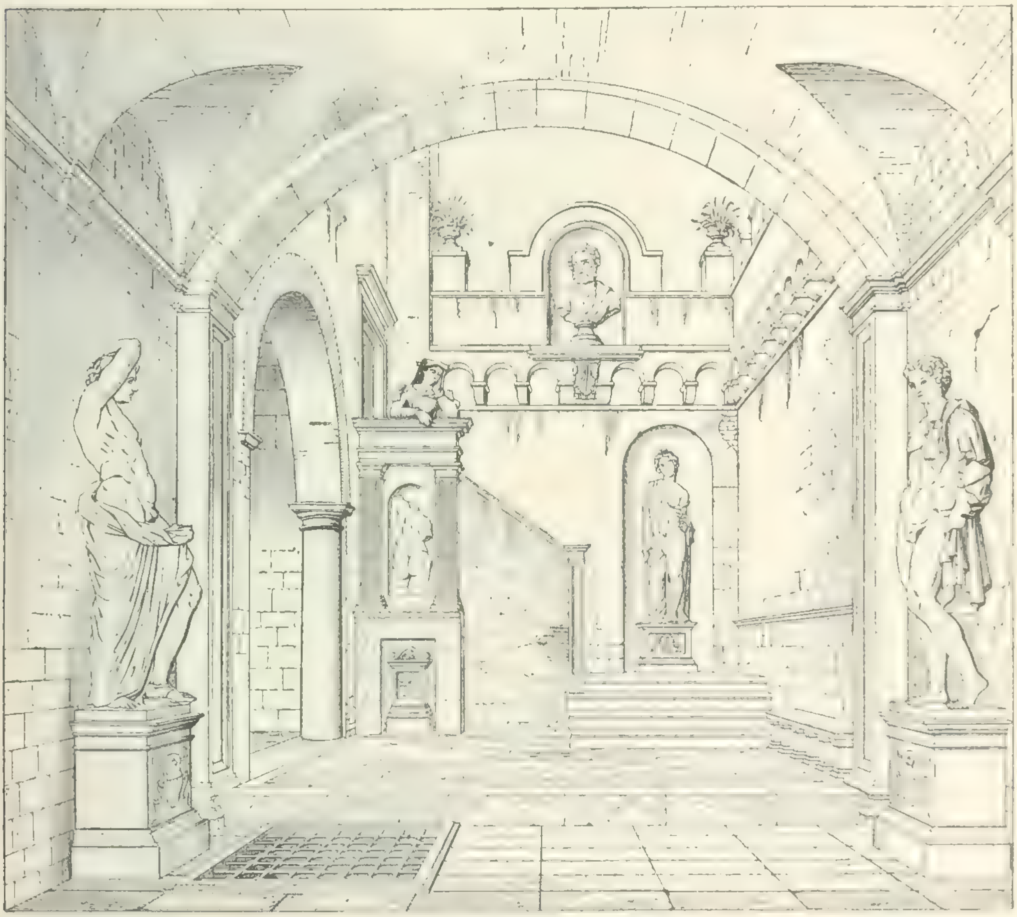


CORTILE

That of the Palazzo Vecchio, at Florence. This was rebuilt by Michelozzo (architect of the Palazzo Riccardi) in 1434. The stuccoes decorating the great pillars have been frequently repaired, but have retained their original character. The fountain in the middle is of porphyry, and the bronze figure is the work of Andrea Verrocchio. The paintings on the walls are views of cities, the work of different painters of the sixteenth century.

CORRUGATE. To form into alternate ridges and furrows (corrugations), as in preparing certain forms of sheet metal, wire lathing, etc., for use in building.

CORRUGATED METAL. Metal which in thin plates has been drawn or rolled into parallel ridges and furrows. The object of the corrugation is to give greater strength to the plates of metal to resist bending in the direction of the furrows, or perpendicular to the general plane of the sheet, also to permit expansion and contraction laterally. Corrugated iron is used largely to cover roofs of buildings of a certain class, machine shops, car houses, barns, etc. The sides and ends of such buildings of the cheaper class are sometimes covered with it. The sheets of corrugated metal are supported on purlins to which they are attached by long hooks, or on sheathing where they are secured with long soft nails driven through and bent on the under side. All holes for nails, rivets, or clamps are made in the top part of a corrugation. — W. R. H.



CORTILE OF THE HOUSE CALLED FORNARINA'S, ROME, THE VESTIBULE, VAULTED, IN THE FOREGROUND

CORS, GUILLERMO DE; architect and sculptor.

According to a document in the archives of the building, Cors succeeded Jaime de Faberan in the direction of the construction of the cathedral of Gerona (Spain) in the year 1330.

Viñaza, *Adiciones al Diccionario historico.*

CORSICA, ARCHITECTURE OF. (See Mediterranean Islands, Architecture of.)

CORTILE. In Italian, a large or principal court; hence, in English usage the court of a palace or *palazzo*, a cloister garth, or any court surrounded by buildings of architectural pretensions. The term is not universal; thus, some large and magnificent courts are never called by this name by Italian writers or by students of architecture.

CORTONA, DOMENICO DA. (See Domenico da Cortona.)

CORTONA, PIETRO DA. (See Berretini, P.)

CORVEE. Forced or unpaid labor exacted in the Middle Ages by the lord of the soil or his overlord, and later, ordered by statute for [illegible] making or the like. Hence, by extension, forced labour of any sort, as in antiquity.

COSMA COSMATUS. (See Cosmati.)

COSMATESQUE (**COSMATESCA**). (The word is derived from the Cosmati (see Cosmati).) Having the character of a kind of architectural decoration which had its origin in the Byzantine work of southern Italy and Sicily, and is characterized by extreme lightness and delicacy and a lavish use of marble mosaics, the materials for which were taken from the ruins of Rome, "*Arte marmoris periti.*" The style was not confined to the Cosmati, one of the most perfect examples being the cloister of S. Giovanni in Laterno (Rome) by Vassallectus. (See Mosaic.)

COSMATI; architects, mosaicists, and sculptors. School of Laurentius.

A family of *marmorarii* (marble workers) in Rome in the twelfth and thirteenth centuries which takes its name from the leading member, Cosma or Cosmatus.

I. Lorenzo, the earliest known member of the family, made two ambons in the church of Ara-Cœli (Rome), one of which bears the inscription, Lavrentivs cvm Iacobo filio svo, etc.

II. Giacomo (Jacobus) assisted his father at Ara-Cœli and made nineteen columns with mosaics in the church of S. Alessio on the Aventine, Rome. Two of them remain and one bears the inscription Iacobvs Lavrentii fecit. His signature is inscribed on the door of the basilica of S. Saba on the Pseudo Aventine (1205). It is also found among the many lapidary inscriptions of the cloister of S. Scolastica near Subiaco (Italy). In 1210, assisted by his son Cosmatus, he built the façade of the duomo of Civita Castellana signed Magister Iacobvs — cvm cosma filio, etc.

III. Cosma or Cosmatus, the most important member of the family, laid the great mosaic pavement of the basilica of S. Magnus at Anagni (Italy), between 1224 and 1231, signed Magister Cosmas hoc opvs fecit. In 1231, with the assistance of his sons, Luca and Giacomo, he made the altar and pavement of the crypt of the same church. The Cloister of S. Scolastica near Subiaco, which seems to have been begun by his father, was completed by Cosmatus and his two sons, Cosmas et filii Lvc. et Iac. His most important work is the chapel called Sancta Sanctorum at the Lateran, signed Magister Cosmatvs fecit hoc opvs.

IV. Luca and

V. Giacomo (Jacobus) simply assisted their father in his work.

VI. Deodatus (Adeodatus), son of Cosmatus, made a ciborium in the church of S. Maria in Cosmedin, Rome (1296), and the finer ciborium in the basilica of S. Giovanni in Laterano (Rome), both of which are signed.

VII. Giovanni, the most important of the sons of Cosmatus, made the tomb of Stephanus Surdi at the church of S. Balbina, Rome, signed Iohs filivs magri Cosmati fecit hoc opvs. This inscription is repeated on the tomb of Bishop Guglielmo Durante in the church of S. Maria Sopra Minerva (Rome). The tomb of Rodrigo Gonsalvi at the church of S. Maria Maggiore (Rome) is also signed by him. The last verse of the metrical inscription on the cloister of S. Paolo fuori le Mura (Rome) seems to indicate that this monument was built by him. (See Cosmatesque.)

Barbier de Montault, *Généalogie d'Artistes Italiens*; Boito, *Architettura Cosmatesca*; Gregorovius, *Geschichte der Stadt Rom*; G. B. de Rossi, *Delle altre famiglie di marmorarii romani*; Frothingham, *Notes on Roman Artists of the Middle Ages*; Perkins, *Italian Sculptors*.

COSMATI WORK. (See Cosmatesque; Cosmati; Mosaic.)

COSMATUS (**COSMA**). (See Cosmati.)

COSSUTIUS; architect.

The construction of the temple of Olympian Zeus at Athens, begun by Antistates (see Antistates) and his associates under Peisistratos and discontinued at the time of the banishment of Hippias, the son of Peisistratos (510 B.C.), was taken up by Antiochos IV. (Epiphanes), king of Syria (reigned 176–164 B.C.). The architect employed by him, Cossutius ("civis Romanus," Vitr.), continued the building in the Corinthian style. The name Cossutius is inscribed upon a base in Athens, which probably carried a statue of the architect. The temple of Zeus was finished during the reign of Hadrian.

Brunn, *Geschichte der Griechischen Künstler*; Vitruvius ed. Marini.

COSTE, PASCAL-XAVIER; architect; b. Nov. 28, 1787 (at Marseilles); d. 1878.

Coste was a pupil of Penchaud, architect in chief of the Bouches-du-Rhône. He entered the *École des Beaux Arts* (Paris) in 1815. In 1818 he was appointed architect to Mehemet Ali, pasha of Egypt. In 1828 he returned to practise in Marseilles and was made supervising architect of that city. The results of his study in Egypt were published in his *Architecture Arabe, Monuments du Kaire* (one vol. folio, Paris, 1839). During the years 1840–1841 Coste was attached, with Eugène Flandin, painter, to the French embassy at the court of Persia. They published in 1844 the great work *Voyage en Perse, Perse Ancienne* (1 vol. text, 4 vols. pls. folio). Independently of Flandin, Coste made observations and measurements of the Mohammedan monuments of Persia, which he published in 1865, *Monuments Modernes de la Perse* (1 vol. folio text and pls.).

Bauchal, *Dictionnaire*.

COST OF BUILDINGS. The cost of buildings (apart from land values) is usually determined in advance by methods described in the articles, Estimating, and Bill of Quantities.

There are two other ways of arriving at the actual cost: by "day's work," when continued record is kept by the builder and clerk of works of all expenditures; and by "measuring up," in which system the work in the building is measured after completion and priced according to a schedule. The former method still prevails to some extent, and for it are claimed the advantage of encouragement of good workmanship, which the contract system fails to give. But the trades union policy of forced equality of service goes far to abolish this old feature of a man's pride in his work, and day's work now has little superiority to compensate for its greater cost. The measured work system is an English one, seldom or never used in the United States. The process is similar to that of taking off quantities (see Bill of Quantities); with, of course, modifications compelled by inaccessibility of internal parts of the building.

— R. W. GIBSON.

COT. A very small and humble dwelling house; in modern times almost wholly poetical in its use.

Bell Cot. (See under B.)

COTMAN, JOHN SELL; landscape painter and architectural draftsman; b. June 11, 1782, (at Norwich, Norfolk, England); d. July 28, 1842.

He went to London in 1800 and exhibited at the Academy until 1807, when he returned to Norwich and became secretary of the Local society of artists. In 1812 he commenced the publication of his *Architectural Antiquities of Norfolk*, which was completed, five series in two volumes, in 1838. Cotman visited Normandy in 1817, 1818, and 1819; and in 1820 published the illustrations to Dawson Turner's *Account of a Tour in Normandy* (2 vols. 4to, London, 1820). He published also *Engravings from Sepulchral Brasses in Norfolk and Suffolk* (2 vols. 4to, 1838).

Binyon, *J. S. Cotman* in *Portfolio*, 1897; Redgrave, *Dictionary of Artists*.

COTTAGE. *A.* A small country house; the residence of a farm labourer or of an agriculturalist of small means. The English cottage previous to the introduction of modern "model cottages" must be understood as having a sitting room with perhaps a lean-to kitchen, and a floor of hardened earth, or at most paved with stones, and one room or two very small ones in the garret among the roof timbers. Such a house would be built of rough stone from the immediate neighbourhood, and roofed with thatch. Even when some taste was shown in the garden and the house itself kept in order, it was without what we should call in modern times necessary provision for comfort and decency. Cottages in this sense have hardly existed within the limits of the United States, for the log cabin was admittedly a makeshift, as were its still slighter predecessors, and the balloon frame house or the commonest shack has glass windows which fit tight, at least at first, wooden floors throughout, and a ceiling to each room; also complete plastering, and is supposed to be warm and dry in all its parts.

B. In the nineteenth century, a country house supposed to be simple as compared with the residences of the wealthy people in the neighbourhood. (See Cottage Ornée.) In the United States the term is used especially for the temporary home of a family which lives ordinarily in the city, and in this connection is applied also to the small houses which are held in connection with a hotel for summer resort, being occupied by persons who hire them of the hotel management, and who usually go to the main buildings for meals. From this usage has been deduced, —

C. In some places of summer resort, or of fashionable temporary residence at any season of the year, a private dwelling house of any, even of the greatest, size and cost. There are cottages at Newport which with their fittings and furniture represent each many hundred thousand dollars.

COTTAGE ORNÉE. In England, early in the nineteenth century, a small villa or rural residence designed in a free and semirustic style, far superior in finish to the common labourer's cottage, but less pretentious in architectural style than the formal villa of the time.

COTTE, FRÉMIN DE. (See Cotte, Robert de.)

COTTE, JULES ROBERT DE; architect; b. 1683; d. Sept. 8, 1767.

A son of Robert de Cotte. He was admitted to the *Académie d'Architecture* in 1711. After 1736 he completed the construction of the portal of the church of S. Roche (Paris) from his father's plans. Jules Robert was employed in the decoration of the royal palace at Madrid from his father's designs.

(For bibliography see Cotte, R. de.)

COTTE, ROBERT DE; architect and decorator; b. 1656 (at Paris); d. July 14, 1735.

Robert was the son or grandson of Frémin de Cotte, architect of King Louis XIII., who served as engineer at the siege of La Rochelle (1627–1628). He was a pupil of Jules Hardouin-Mansart (see Hardouin-Mansart, Jules), whose wife's sister he married. Mansart confided to him the direction of the works at the *Invalides* and other important buildings. He was made a member of the *Académie Royale d'Architecture* in 1687 and *architecte du roi* in 1689. Between 1700 and 1702 he directed, under the supervision of Mansart, the works at the Hôtel de Ville at Lyons, France. About 1707 he rebuilt the central tower of the cathe-

[illegible] of Orleans. At the death of Mansart in 1708 he succeeded him as *premier architecte du roi*. The portal of the church of S. Roche (Paris) was designed by Robert in 1734, and finished by his son Jules Robert de Cotte (see Cotte, J. R. de). Robert de Cotte built the peristyle of the Grand Trianon at Versailles. He made designs for the royal palace and Buen-Retiro at Madrid.

Destailleur, *Notice sur quelques artistes français*; Dussieux, *Les artistes français à l'étranger*; [illegible], article in *Encyclopédie d'Architecture*; Lance, *Dictionnaire*.

COTTER. (As used in wedging and the like, see Key.) Also Cottar, Cottrel.

COUCY, ROBERT DE. (See Robert de Coucy.)

COULOMBE, MICHEL. (See Colombe, Michel.)

COUNCIL HOUSE. Among the American Indians a wigwam, tent, or other structure in which meetings are held to discuss public business of the tribe, or subtribe. The Pueblos used the kiva for such meetings. (See also Tiyotipi.) — F. S. D.

COUNTER. *A.* In a mercantile establishment or bank, the long shelf or table which separates the employees and the customers, and in the former a centre table for the display of goods. In banks, offices, and counting houses, it is formed like a continuous desk with a closed back toward the customer or client, and is surmounted by a screen or grille of metal, with openings for the transaction of business. In shops, the counters are flat tables, from 2 feet 6 inches to 3 feet high, and 2 feet to 4 feet wide, with polished tops of hard wood; those nearest the wall have usually panelled backs toward the public; those between "aisles" or passages are often merely rows of strong tables set end to end. Butchers' counters are of marble or of heavy timbers, matched and bolted, for chopping and dressing meat upon them; and for saloons, drug stores, and other purposes, other special forms of counters are provided.

B. Formerly, in England, an engineer's clerk of works or *compter* (computer); obsolete.

— A. D. F. H.

COUNTER CEILING. A secondary ceiling interposed between the floor and ceiling of a room, to exclude sounds originating in the room above. A layer of sound-obstructing material or deafening, either mineral wool, sawdust, or the like, is sometimes spread over the upper surface of the counter ceiling to assist in opposing the transmission of sound.

COUNTERFORT. In masonry structures a buttress or projecting portion, extending upward from the foundations, to impart additional resistance to thrusts. By some writers the term is restricted to piers or spur walls projecting from the inner face of a basement, abutment, or retaining wall, and so distinguished from the buttress, which is external. (See Buttress; Retaining Wall.)

COUNTERLIGHT; COUNTERLIGHTING. A light or window directly opposite another. A room having corresponding windows on opposite sides is said to be counterlighted, and the same term is used of a picture having a window directly opposite it — a very unfavourable position for artistic effect. Counterlighting should be avoided for schoolrooms and reading rooms, except when these are of exceptional width. (See Cross light.)

COUNTERPOISE. A weight which tends to balance the action of another weight; in architecture, especially, a weight considerably greater than another and which prevents any injurious action by the latter. A corbel, for instance, acts by means of the heavy counterpoise which holds in place its longer and heavier member, generally built into the wall; and prevents the dislocation of the building by the weight acting upon the projecting part of the corbel. In the ancient building of India, almost all of the most remarkable pieces of construction have been carried out by means of a system of counterpoise, as the arch is almost ignored, except in decorative architecture, and a system of corbels and braces resting upon them is at the bottom of all extensive and elaborate work. (Compare Cantilever.)

— R. S.

COUNTERSINK (n.). *A.* A hole or depression made by or for countersinking. In this sense, also countersinking.

B. An instrument for countersinking.

COUNTERSINK (v.). *A.* To form a depression or hole for the reception of a piece or member which is not to project beyond the general surface. The cutting may be made to fit accurately the object, as in setting a hinge flush with the surrounding woodwork, or it may be a recess larger than the member, as a hole made to receive the head of a bolt.

B. To let into a surface by means of a recess as above described.

COUNTER WALL. An independent side wall erected against that of an adjacent existing building, when the latter stands entirely upon its own side of the party line. Counter walls are necessary when there is no party wall (*i.e.*, a wall centred upon the party line), except when the right is acquired by purchase or otherwise of using the existing adjacent side wall for the new building, and the wall is heavy enough for the purpose.

COUNTESS. (See Slate.)

COUNTRY HOUSE. A residence so far away from a city or large village that it stands free among its outbuildings and dependencies, and is beyond the sidewalks and out of easy reach of the shops, etc., and has to be in a certain sense self-contained. This requirement is diminishing, however, with the increase of facility in communication, the general use of the telephone, and, at least in England, of the house to house delivery of mail matter.

Country houses may be considered under the following heads: Castle; Château; Cottage; Country Seat (under Seat); Manor House; Schloss; Seat; Villa; and also under the terms Abbey; Hall; which enter into the names of many English country houses of importance. — R. S.

COUNTRY SEAT. (See under Seat.)

COUNTY COURTHOUSE. In the United States, the courthouse for one of the counties, or — in Louisiana, and other parts of the South — parishes, into which the states are divided. As these courthouses were commonly built at a convenient point near the middle of a county and near a point where highroads met, a village would tend to grow up about each one. Maps of the United States still show many small villages under the name, such as Amherst Courthouse, or Amherst C. H. in Virginia; Laurens C. H., South Carolina, etc. In large cities, sometimes, the term denotes the building in which the state or county courts are held as distinguished from the city courts.

— R. S.

COUNTY HALL. In Great Britain, a public edifice for various county functions, comprising a large hall for public meetings and festivities, accommodation for the county courts and petty sessions, a grand jury room, county clerk's office, etc.

In the United States generally called County Building or County Courthouse. The county administrations are often accommodated as cotenants in state and municipal buildings, and have no special building for their use in the county seat or shire town. County halls exist, however, in the larger and richer county towns, with courtrooms, offices, jails, etc.; they are, however, more commonly called county buildings or county courthouses. — A. D. F. H.

COUPLE (n.). *A.* A pair of forces equal, parallel, and acting in opposite directions, but not in the same straight line. They tend to make the body acted upon rotate about an axis upon which they exert no pressure.

B. A pair of rafters with their tie beam, collar beam, or other pieces which go to make up the simplest form of truss. (Compare Crutch.)

Main Couple. A pair of principals; one of several couples which support other subordinate rafters.

COUPLE (v.). To arrange, set, or unite in pairs. The term is used in combination with a great variety of structural terms, and is generally self-explanatory. Coupled columns are those which are united in pairs, the two columns of the pair being very close together, as in the arrangement called Aræosystyle. The arrangement is not known to have existed in antiquity, although the plates of Wood's *Ruins of Baalbec and Palmyra* show at least two instances of it. The conjectural restorations contained in those plates have not been absolutely verified. It is often thought that the first instance of it is the great colonnade of the Louvre which was built in the seventeenth century. Coupled pilasters occur in the Palazzo Stoppani Caffarelli (Vidoni) and the Palazzo Chigi, in Rome, both of the sixteenth century.

COUPLE CLOSE. Same as Couple, *B.* Hardly used in modern times except in heraldry.

COURAJOD, LOUIS CHARLES LÉON; archæologist; b. 1851 (at Paris); d. 1896.

Courajod was educated at the *École Nationale des Chartes*, Paris, and was appointed *conservateur* of mediæval, Renaissance, and modern sculpture at the *Musée du Louvre.* He was a member of the *Commission des Monuments historiques.* He published *Histoire de l'Enseignement des Arts du dessin au XVIII^{e} siècle*, *Les estampes attribuées à Bramante* (in collaboration with Von Geymuller); *Études sur les collections du Moyen-âge, de la Renaissance et des temps modernes au Musée du Louvre*; *Alexandre Lenoir, son journal et le Musée des Monuments français*, etc.; *Documents sur l'histoire des arts et des artistes à Crémone aux XV^{e} et XVI^{e} siècles*; *Quelques monuments de la Sculpture française des XV^{e} et XVI^{e} siècles*, etc.

Construction Moderne, July 11, 1896.

COUR D'HONNEUR. The principal court, often the fore court, by means of which direct access is had to the principal apartments of a palace or to the most important public offices of a building. The name originates in the reservation of this court to visitors of distinction, whose carriages alone would be allowed to pass the outer gateways. It is of necessity most often the outer or exterior court, and is often enclosed between the principal front of the building and its projecting wings, the fourth side being enclosed by inferior and lower buildings, or by a wall or iron grating.

COURSE (n.). One (generally one of many) horizontal — or less frequently inclined — row of relatively small pieces, uniformly disposed and more or less connected, bonded, or united in one structure or member, as of bricks when laid in a wall, slates on a roof, and the like.

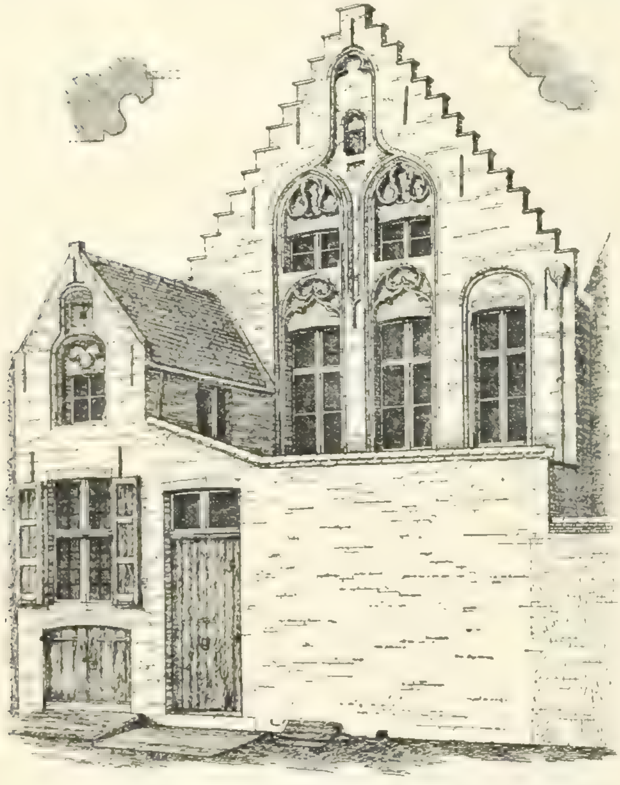
Blocking Course. A parapet; usually a very plain wall like a range of stone blocks, used to replace a pierced parapet, a balustrade, or the like. In some cases the blocking course is not a true parapet, because too low to serve in that capacity, or because the roof has been raised to the top of it. In this case it is a mere flat band above the wall surface. (Compare Bahut.)

COURSE (v. t.). *A.* To lay in courses, as masonry; to lay evenly and more or less regularly, approximating uniform and regular courses.

B. To build in courses of masonry, as a wall or pier.

COURT. An open area intimately connected with a building or buildings, as:—

A. A yard surrounded or nearly surrounded by buildings and often intended to afford light to their interior windows. The court of a mediæval strong castle, that of an Italian palazzo, and that of a modern college or statehouse, are equally intended to give light to the buildings fronting on them, and, in many cases, the chief light must be drawn from within; whereas in a modern hotel on the Continent of Europe the court has so long been considered an essential thing, and the *habitués* of such a hotel are so accustomed to treat the open space as a kind of sitting room in pleasant weather, where they take coffee and the like, that the open space is retained, although now commonly sheltered from the weather. Houses in the Levant, in Northern Africa, and in Turkey, have commonly no windows on the exterior (at least in the lower story), but the court is surrounded by arcades, and the rooms, which are not usually large, receive their light from the doors and from small windows. Moreover, because of the need of privacy, while at the same time there is the fixed habit of sitting, eating, and sleeping in the open air, it is very usual in warm countries to build around an enclosed court; thus, the old houses of New Orleans are so arranged, and the buildings of Spanish America have in their courts (see Patio) the same convenience which the inhabitants of northern countries where the summer is shorter, find in the veranda. It is, however, hard to explain the avoidance of the court by people of Teutonic race, who even in the hottest parts of India use the veranda instead. Probably the common use of the court is a reminiscence of times when violence was more usual and when the shelter of the outer walls was found necessary.



Court at the Front of a House in Bruges, built c. 1730.

B. A larger and freer space enclosed by walls, but not encompassed by the principal buildings; as in a mediæval castle, where there were inner and outer courts, some of which were not more enclosed than by the strong walls which served as their defence.

C. By extension, a high room surrounded by smaller and lower ones, or by rooms or galleries in several stories. Thus, in a building for temporary exhibition, a court is often a large area open to the topmost roof, and devoted altogether with its surrounding galleries to a special line of exhibits.

D. Anciently, a castle or manor house, or large country dwelling. From this use of the term is derived its frequent occurrence in the names of English dwellings, as in the well-known instance of Hampton Court. (Cut, cols. 701, 702.) — R. S.

COURTHOUSE. A building in which are contained rooms for courts of law. The term seems always to have been rare in Great Britain, but is common in the United States. In some of the states, the county courts being located in a building set near the centre of the county and not necessarily in any previously existing city or village, the little village which has grown up around it is called simply "Courthouse." (See County Courthouse.) Besides the court-rooms, other rooms are included, such as Judges' Chambers (see under Chambers), offices of clerks of court, which are sometimes very spacious and arranged for the doing of an immense amount of business. In a few instances these buildings are very costly with much architectural pretension. — R. S.

COURT OF GUARD. In the military architecture of the Middle Ages, a guardroom, the term being apparently extended from the outer court of a castle where the guard for the day were mustered.

COURT OF THE LIONS. In the Alhambra, Spain; one of the two principal courts of the building, 116 feet long and surrounded by a roofed arcade. In the middle is the Fountain of the Lions, which gives it its name.

COURTYARD. Same as court in sense *A*; or, as distinguished from that term, especially a confined and strictly enclosed court; as in a castle, a prison, or a modern building, where it forms a shaft or well intended to give light to interior windows. (Cuts, cols. 703, 704; 705, 706.)

COUSIN, JEAN (JEHAN); painter, glass painter, and sculptor; b. 1500 or 1501 (at Soucy near Sens, Yonne, France); d. 1589.

Cousin was surveyor, painter, engraver, illustrator, sculptor, architect, and writer. The only notice of him in the royal accounts is an entry concerning employment as sculptor (*imagier*) at Fontainebleau about 1540–1550. His splendid statue of Admiral Chabot is in the Louvre. Cousin was above all a glass painter. The window of the Tiburtine Sibyl in the cathedral of Sens (injured by a cannon-ball at the siege of Sens in 1814) is his work, and the rose window of the Paradise in the same church is doubtless also by him. The great window of the Martyrdom of S. Lawrence at the church of S. Gervais (Paris), glass in the church of S. Étienne-du-Mont (Paris), and a fine head at the Musée des Arts décoratifs (Paris) are ascribed to Cousin. Cousin made five windows *en grisaille* at the château of Anet which have been destroyed. He published his *Livre de Perspective* in 1560 (Paris, folio), and his *Livre de Portraicture* in 1511 (Paris, 4to).

Firmin-Didot, *Étude sur Jean Cousin*; Firmin-Didot, *Œuvres choisies de Jean Cousin*; Palustre, *La Renaissance en France*; Robert-Dumesnil, *Le Peintre-graveur français*; Ottin, *Le Vitrail*; Millin, *Antiquités nationales*.

COUSSINET. (French; occasionally transferred into English in one or another of its various meanings.)

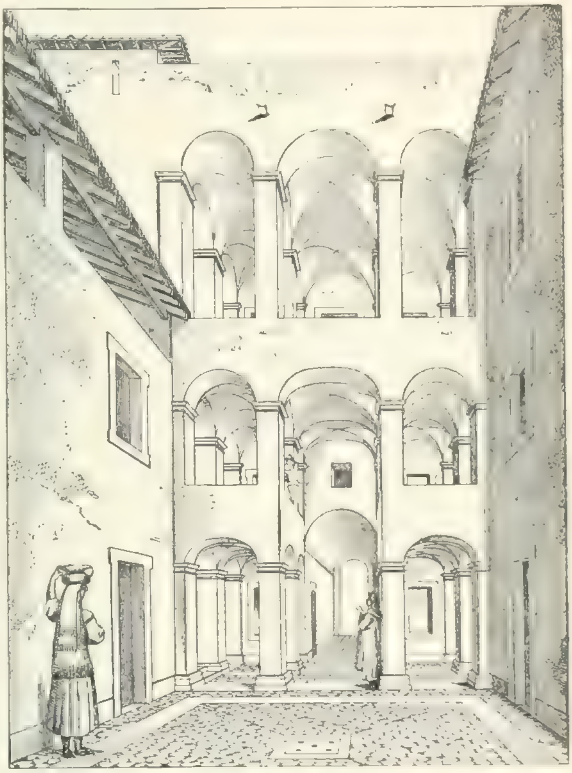
A. The lowest stone or voussoir of an arch, resting on the impost and having its upper surface inclined toward the centre of the arch (see Skewback; Impost).

B. The whole band or cushion of the Ionic capital, including the two volutes and the flat or depressed band connecting them.

COUSTOU, GUILLAUME; sculptor; b. April 25, 1677 (at Lyons); d. Feb. 22, 1746. Guillaume was a brother of Nicolas Coustou (see Coustou, N.) and nephew and pupil of Antoine Coysevox (see Coysevox, A.). He won the *Premier Grand Prix de Rome* in 1697 and was made *académicien* in 1704. He did much work for the decoration of the château and park of Versailles.

Gonse, *Sculpture française*; Dezallier d'Argenville, *Vie des fameux sculpteurs*.

COUSTOU, NICOLAS; sculptor; b. Jan. 9, 1658 (at Lyons); d. May 1, 1733.



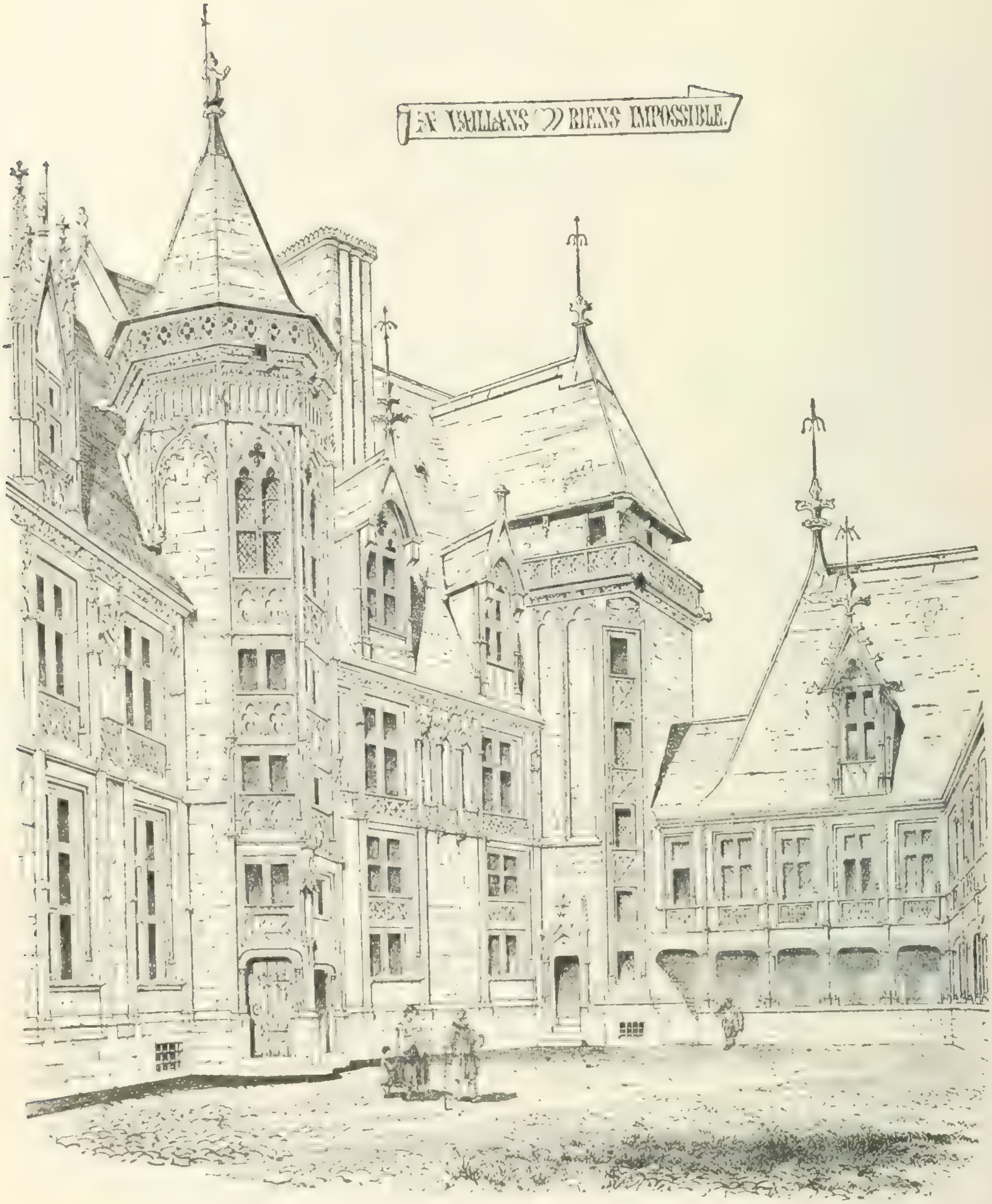
Court of House situated at the Foot of the Tarpeian Rock; Rome, Italy.

Nicolas was the son of François Coustou, a wood carver of Lyons. At the age of eighteen he entered the atelier of his uncle Antoine Coysevox (see Coysevox, A.) in Paris. He won the *Grand Prix de Rome* in 1682. In 1692 Nicolas began the groups of prophets at the church of the *Invalides* (Paris). Between 1701 and 1710 he assisted in the decoration of the château of Marly. Several of his works there were afterward brought to the Tuileries. The statue of Louis XV., now in the Louvre, was made in 1731.

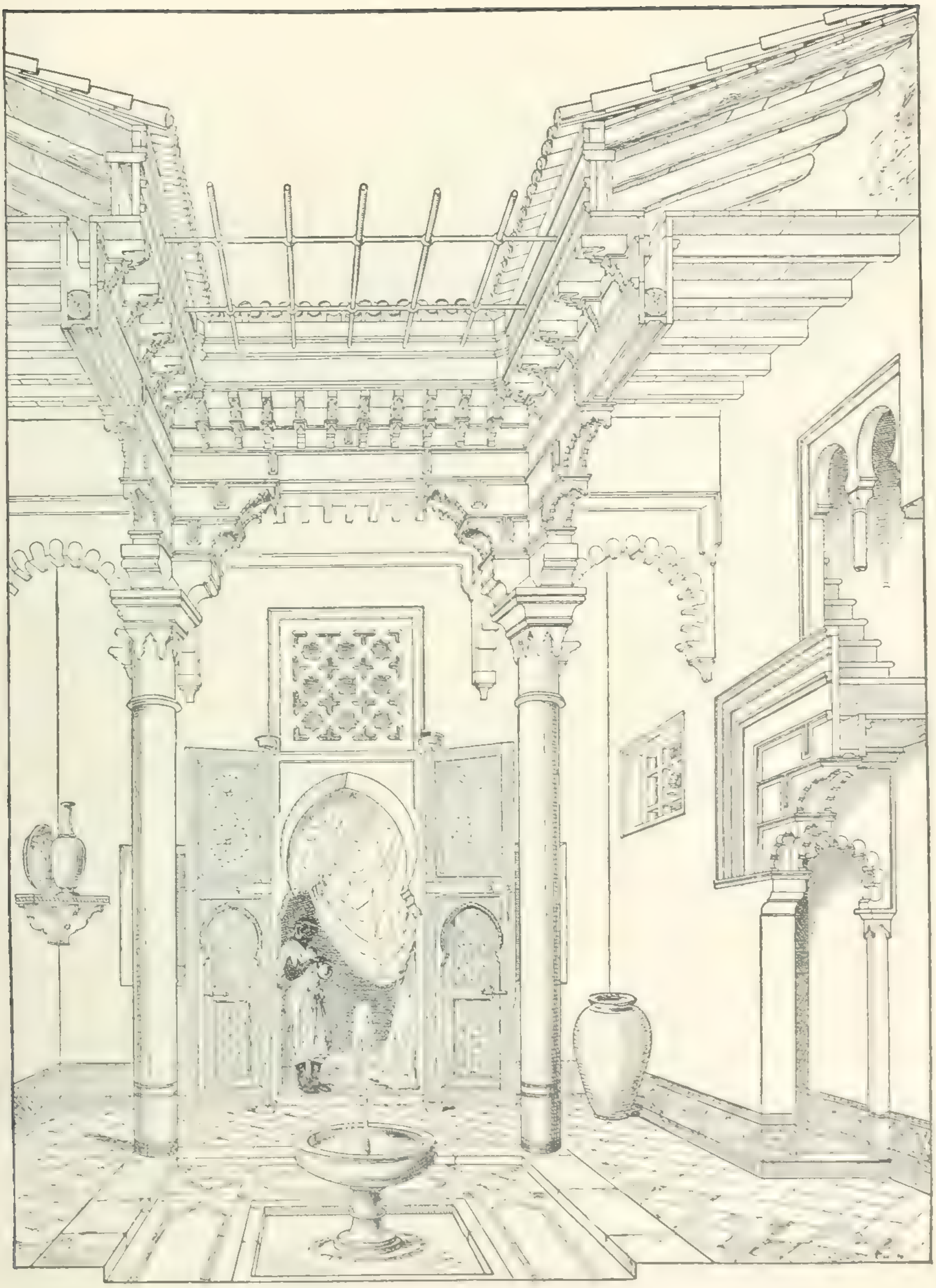
Cousin de Contamine, *Éloge de Coustou*; Mariette, *Abecedario*.

COUTURE, GUILLAUME (Martin); architect; b. 1732 (at Rouen); d. Dec. 27, 1799.

In 1776 Couture was employed in the reconstruction of the *Palais de Justice* (Paris) aga


A VAILLANS ♥♥ RIENS IMPOSSIBLE.

COURTYARD OF HOUSE OF JACQUES CŒUR, BOURGES.



COURTYARD IN A MOORISH HOUSE IN TANGIERS.

built the façade on the cour d'honneur. He was associated with Contant d'Ivry (see Contant d'Ivry) in beginning the construction of the church of the Madeleine, Paris, in 1764, and at the death of Contant in 1777 took charge of the works. He changed the original design by adding two bays to the nave. (For transformations of the Madeleine see Vignon, B.)

Lance, *Dictionnaire*.

COVE (n.). A surface of concave, more or less cylindrical, form, whether of a small moulding or of a large structure, as a vault or cornice.

COVE (v.t.). To construct with a cove or coves; to give the form of a cove to.

COVE BRACKETING. The series of brackets or frames prepared and set to receive the laths for a cove, as in a coved ceiling.

COVED ARCH. (See Cloistered Vault, under Vault.)

COVED CEILING. The upper side of a room which is so designed that coves, large in proportion to the extent of the ceiling, join the vertical wall with the flat part of the ceiling. In interiors of the eighteenth century (see Rococo) the cove is often very large and without strong horizontal markings, either on the wall side or on the ceiling, and is richly adorned with paintings and carved panels which are, therefore, displayed in a position relative to the eye of a person sitting or standing below, which makes them easy to see and enjoy.— R. S.

COVED VAULT. (See Cloistered Vault, under Vault.)

COVER. That part of a roofing tile, slate, or the like, which is covered by the overlap of the course above.

COVERED ALLEY. A primitive stone structure of a kind abounding in Great Britain and Brittany, as well as in other parts of the world. It is composed of two rows of flat stones set vertically and sustaining a roof of rough lintels, the whole 20 or 30 yards long. In most cases it is the entrance passage to a Cistvaen. (Compare Cromlech; Dolmen; Menhir.)

COVING. *A.* That part of a structure which forms a coved projection beyond the parts below, as a concave, curved surface under the overhang of a projecting upper story; a cove or series of coves.

B. The curved or splayed jambs of a fireplace which narrows toward the back.

COWL. A cap, hood, or like contrivance for covering and protecting the open top of a pipe, shaft, or other duct while permitting the free passage of air. It may be merely a bent-over portion of the pipe or a more elaborate device, as a contrivance for improving the draught of a chimney; usually a metal tube or pipe nearly as large as the flue and arranged at top with a curve so as to bring the smoke out in a nearly horizontal direction. It is customary to make the curved tube separate, free to rotate, and fitted with a wind vane, so that it will turn easily and always present the convex or closed part of the curve to the force of the wind. The term is also applied to a similar contrivance at the top of a ventilating shaft.

COYSEVOX (pronounced Coesevau), **ANTOINE**; sculptor; b. Sept. 29, 1640 (at Lyons); d. Oct. 10, 1720.

Coysevox, the favourite sculptor of Louis XIV., was the son of a cabinetmaker of Lyons (Rhône, France). In the baptismal records the name is written Quozeveau. He spelled it Quesceveau. At the age of seventeen he entered the atelier of Larambert in Paris. He was appointed *sculpteur du roy*, and in 1667 began to work on the decoration of the Louvre under the direction of Charles Lebrun (see Lebrun, C.). From 1678 to 1686 he directed the sculptural decoration of the palace at Versailles, especially the *Escalier* (stairway) *des Ambassadeurs*, the *Galerie des Glaces*, and the *Salon de la Guerre*. He made numerous statues for the exterior of the palace, and, in the park of Versailles, the *Fontaine de la Gloire*, and many statues, vases, and the like. October 29, 1678, he was made professor at the *Académie*, Paris. His works at the château of Marly are now much dispersed. Coysevox designed the monument of Cardinal Mazarin now in the Louvre, the monuments to Colbert in the church of S. Eustache, Paris, the monument of Charles Lebrun in the church of S. Nicolas du Chardonnet, Paris. A list of about 300 of his works is given by Jouin, op. cit.

Jouin, *Antoine Coysevox*; Gonse, *Sculpture française*; Dezallier d'Argenville, *Vie des fameux sculpteurs*; Fermelhuis, *Éloge funèbre de Coysevox*; Genevay, *Style Louis XIV.*; Maquet, *Paris sous Louis XIV.*

COZZARELLI, GIACOMO; architect and sculptor; b. 1453; d. 1515.

Cozzarelli was a pupil of Francesco di Giorgio Martini (see Martini, F. di G.) who was interested in the revival of wrought-iron work in the fifteenth century (see Caparra). Especially notable are the torchholders of the Palazzo Pandolfo Petrucci in Siena (Italy). He enlarged the church of the Osservanza (Siena), and did some good work in coloured terra cotta.

Müntz, *Renaissance*.

CRAB. In building, a winch or similar machine for hoisting weights, used in connection with a crane, derrick, and the like.

CRADLE. Any light framework of small and slender parts, — as furring strips or the like, — forming a support or backing for other work, especially when extending in a generally horizontal direction, as the centring of an arched drain, the furring used to support a cornice or a plaster imitation of a vault, or the like.

CRAIG, JAMES: architect; d. June 23, 1795.

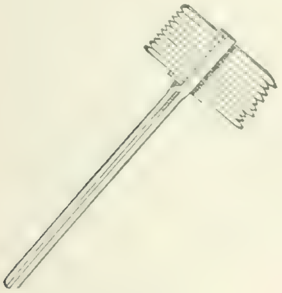
Craig was a nephew of James Thomson, the poet, and a pupil of Sir Robert Taylor (see Taylor, R.). In 1767 he won a competition for a plan for the construction of new streets and squares in the city of Edinburgh (Scotland). The "New Town" of Edinburgh was built according to this plan.

Redgrave, *Dictionary of Artists of the English School*.

CRAMP. *A*. In masonry, a small metal member to secure together two adjoining parts or pieces. It is usually a short flat bar, having its two ends turned down at right angles and embedded in holes in the stones.

B. Same as Clamp.

CRANDALL. In stone dressing, an axelike instrument used in finishing the softer stones. Its head consists of a number of movable steel points, secured side by side in a slot through the end of the handle, thus forming a toothed edge parallel to the handle.



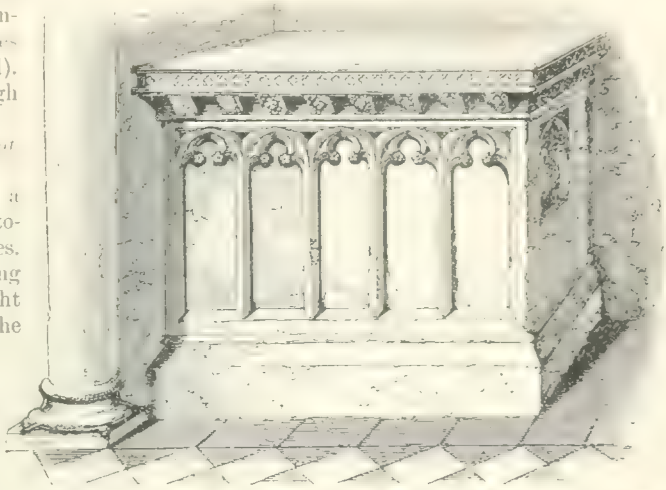
CRANDALL.

CRANE. A machine for raising, lowering, and generally moving weights. In its original and simplest form, it consists of an upright leg, — fixed, or more often pivoted, — from which projects a fixed arm bearing a wheel or pulley. In modern times this form has been developed into a trussed or built-up structure curving outward as it rises from its base, and thus forming a cantilever. By extension, the term is also applied to various other forms of hoisting machines, even to such as have two legs or supports, the beam or arm being always fixed to the support, which feature alone distinguishes cranes from some forms of derricks. Aside from building operations, the most common use of cranes in connection with architecture has been in their application to fireplaces for the suspension of household utensils over the flames. For this purpose they were usually of wrought iron, frequently elaborate and beautiful in design, and either secured to the chimney back or forming part of a large and heavy andiron. — D. N. B. S.

Travelling Crane. One arranged to move as a whole along a track.

CRAPINA, MARTINO DA. (See Martino da Crapina.)

CREASING. A course, or several courses, of tiles or bricks laid upon the top of a wall or chimney with a projection of an inch or two for each course over the one below, to throw off water. The coping, if there is one, comes above the creasing. A layer of slates or of metal over a projecting string course or window cap, serving as a flashing to prevent the infiltration of moisture, is also called a creasing. The term is little used in the United States.



CREDENCE FROM CHURCH OF S. CROSS, NEAR WINCHESTER, C. 1400

CREDENCE; CREDENCE TABLE. In ecclesiastical usage, a table placed on one side of a sanctuary as a convenience to the officiant and upon which the church vessels, service books, etc., are kept. This is sometimes movable, but sometimes is the shelf of a recessed cupboard, the top of which may receive architectural treatment.

CREMATOR; -TORIUM; -TORY. A furnace for the destruction by heat of any substance; preparation being made for the complete incineration of the substances burned, the carrying off of the gaseous products in a thorough and harmless way, and the protection of surrounding parts of the building, or of other buildings, from a dangerous heat. There is usually a crematory attached to a dissecting room, and it is considered important that this should do its work thoroughly, while attracting but little attention. Recent hygienic science has introduced the use of small furnaces of this kind in connection with the kitchens or sculleries of ordinary dwelling houses, in order that rubbish which would otherwise be thrown into the dust bin or carried away in barrels, thus perhaps spreading contagion of some kind, may be disposed of in a cleanly, thorough, and safe way. The larger furnace used for the incineration of human corpses is generally estabplaced far from any large town, and has some surroundings intended to be pleasant to the eye, and to accommodate mourners who accompany the corpse to the place of cremation. The furnace itself is so arranged that the corpse will not be brought in contact with fuel other than burning gas; because it is required that the ashes of the corpse shall not be mingled in the slightest degree with other results of combustion. Slightly differing processes are employed to reach this result, but in general it is true that the flame — in the sense in which burning gas following a powerful draught is flame — is that which reaches the corpse and which reduces it to uniform, dry, and cleanly ashes. — R. S.

CRENEL. The embrasure or open space between two merlons or solid portions of a battlement or castellated parapet. It originally signified any opening in a defensive work for an outlook or the discharge of missiles.

CRENELATE. To form with battlements, as a parapet; to furnish with battlements, as a building. In former times in Europe the right to crenelate was a matter of royal licensure.

The adjective *crenelate* is sometimes used instead of *crenelated*, the participial adjective from the above verb. (Written also crenellate.)

CRENELET. *A.* A small crenel, whether in an actual battlement or in a decorative design imitating one.

B. A small loophole.

CRENELLE. Same as Crenel.

CREOLE ARCHITECTURE. That of the peoples of European descent in tropical and subtropical America — French, Spanish, English, etc., in the West Indies; French and Spanish in New Orleans, and the like. The term Creole differs in its special application, but means always, born in the new country of pure European stock; and this applies to cattle, poultry, etc., as well as to mankind. (See Mexico, Part II.; South America; United States, Part II.; West Indies.)

CREPIDOMA. In Greek archæology, a foundation; especially, in modern usage, the whole foundation of a temple or other Greek building, including the flat floor or pavement of the naos, pteroma, etc., and of the masonry substructure. It is common to use the term for the floor alone, upon which still remain either fragments or traces of the walls, the columns, etc., from which the study of the ruined building can be undertaken.

CREST; CRESTING. An ornamental member, or a group or series of members, used to form a decorative finish at the top of any structure; as along the ridge of a roof, as an elaborate coping, the top of a pinnacle, or the like. *Crest* may perhaps be considered as restricted to mean an isolated single ornament, while *cresting* may be more properly applied to a continuous feature.

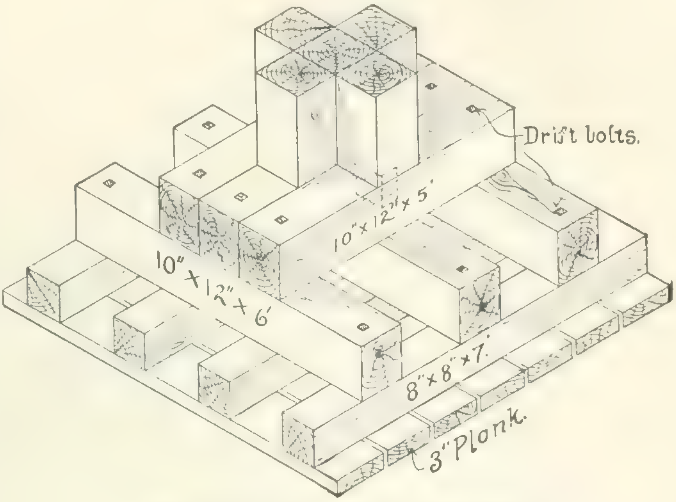
CREST TABLE. A crested or saddleback coping, more or less ornamental, often finished at the top with an astragal, frequently used for the top of a wall, especially of the merlons and crenels of a battlement.

CRETE, ARCHITECTURE OF. This great island has been little explored because, still remaining nominally under Turkish control, it has been the chosen spot for insurrections in the Greek interest; and parties of foreigners are looked on with suspicion and feel themselves to be in danger. The constant insurrections, in which the Mussulman and Christian forces have proven nearly equal, have resulted also in the complete destruction of many villages, including important buildings. Such buildings, and even some which have not been deliberately ruined, are used as quarries by modern builders and lime burners. The recent policy of the Ottoman government in preventing the exportation of sculptures and other antiquities, and keeping them for the museum at Constantinople, though perfectly reasonable and justifiable, has resulted in a do-nothing policy in countries which, like Crete, are far removed from the centres of Ottoman power, and are disfranchised politically. Foreigners have only now begun to receive permission to dig, and the government will undertake nothing. Even when foreigners desire permission merely to explore, and are willing to turn over to the authorities all objects which may be found, difficulties have been made. Explorations by the American School of Classical Studies at Athens, or by the Archæological Institute of America, have resulted chiefly in the discovery of inscriptions and of fragments of sculpture; and the architecture is as yet little known, although remains at Gortyna and Cnossus are known, and others are being brought to light. This is partly because no adequate measured drawings nor even photographs have been published.

Historically, it seems certain that Cretan civilization was much more ancient than that of the mainland of Greece, and much less modified by the Dorian and other invasions; that on this account its time of glory and power had passed before what is to us the historic age, and the age of Grecian art properly so called. (For the details of the very early buildings, see Pelasgic Architecture.) — R. S.

CRIB. *A.* A structure of logs, bars, or strips, intended to be left open without enclosure. Specifically, in engineering, a frame of timber filled generally with stone to load it and keep it in place. It is formed of longitudinal courses of logs or square timbers, rarely less than three in number, spaced 8 to 10 feet apart, which are tied together with transverse ties of smaller timber, spaced 5 to 6 feet, and notched, or halved, or dovetailed over each timber of the longitudinal course, and spiked or trenailed at each crossing. The whole crib therefore is divided into cells which are filled generally with stone, sometimes with concrete or earth. Such cribs are used chiefly for docking and wharves, as retaining structures, piers for temporary bridges, foundations under water, etc. Being of timber they are not durable except under water.

B. In house-moving (see Shoring) the system of timbers placed under each runner or long timber on which the rollers are placed. It is composed of longitudinals laid upon the ground, connected by cross pieces simply laid on them, and supporting other longitudinals and cross pieces to the proper height. Their purpose is also to give bearing surface on the ground for the weight upon the runners.



Crib of Timber, forming a Footing.

C. Any small and slight building walled and roofed wholly or in part with open framing, or with strips having open spaces between. (See Corn Crib.) — W. R. Hutton.

Crib for Hay, at Haslithall, Switzerland.

CRIBWORK. Same as Grillage. (See also Foundation.)

CRICKET. A piece of sloped roofing laid in an otherwise horizontal valley so as to produce one or more sloping valleys to throw off water which would otherwise be retained. Thus, if a sloping roof is interrupted by a chimney standing squarely across the slope, a horizontal valley would naturally result along the upper side. It is therefore usual to construct there a small piece of roofing sloping laterally in one or both directions, so as to produce one or two diagonal valleys at its meeting with the main roof.

CRIOSPHINX. An Egyptian sphinx of the kind which combines the head of a ram with a lion's body.

CRIPPLE (adjectival term). Same as Jack.

CRIPPLE WINDOW. Same as Dormer Window. Local English. — (A. P. S.)

CHRISTOFANELLO. (See Battista di Christofanello.)

CRITIUS (Kritios); sculptor.

The bronze statues by Antenor of the tyrannicides Harmodios and Aristogiton which had been raised upon the Acropolis at Athens were taken away by Xerxes in 480 B.C. About 470 B.C. the sculptors Critius and Nesiotes were commissioned to replace them. Several representations of their work have come down to us.

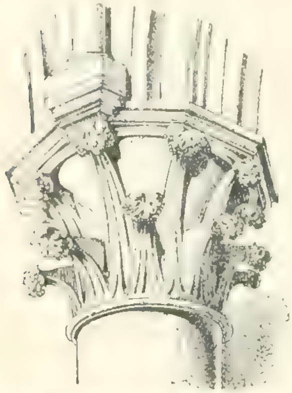
Mitchell, *History of Greek Sculpture*.

CROATIA, ARCHITECTURE OF. This, so far as of general interest, is concentrated in the cities of Agram (Zagrab or Zagreb), the ancient capital; Varasd (or Varazdin); and Karlstadt (or Karlovac). Of these, the first-named consists of three well-marked divisions; the ancient city retains its curious fortifications, and includes a mediæval bishop's palace somewhat defensible, with battlemented towers, the cathedral with a Romanesque front of the eleventh century, and modern public buildings of some interest. The other towns named are more like large villages than cities in the usual sense. The provinces are known to contain Roman remains of interest, but as yet they have not formed the subject of careful study. (See Austrian States; Hungary.) — R. S.

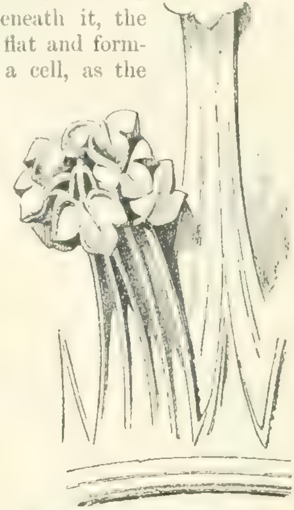
CROCKET. In Gothic architecture, an ornament consisting of a projecting piece of sculpture worked on the edge of a gable, on one of the sloping ridges of a spire, or on any upright of ornamental character, such as the side pieces of choir stalls, or the like. The most usual character of the carving is a piece of leafage with a strong stem or rib, the leafage being often much in relief, and fantastically cut. The term is derived from the French *crochet*, which signifies any piece of leafage or similar ornament forming one member of a design, such as one corner of a foliated capital; but this more general usage has not prevailed in English. — R. S.

CROK. Same as Crutch.

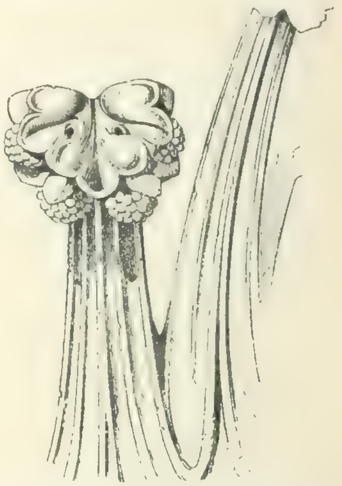
CROMLECH. A rude stone monument of prehistoric or uncertain date (compare Dolmen; Menhir). As the three terms are Keltic words whose significance is not accurately reproduced in the modern term, differences exist in the application of all three words. Thus, cromlech in Welsh means a stone supported on three or more stones set upright beneath it, the uppermost one being somewhat flat and forming a table top or the roof to a cell, as the monument may be regarded; but such a structure is called dolmen in Brittany (N. E. D.). It is generally assumed that these monuments are sepulchral chambers, and that the intention has generally been to heap the earth around and above them so as to form a mound or barrow. — R. S.



Crockets on a Capital, Cathedral of Semur (Cote-d'Or).



Crockets from Capitals in Choir, Cathedral of Semur (Côte-d'Or).



Crockets from Capitals in Choir, Cathedral of Semur (Cote-d'Or).

CRONACA, IL (SIMONE DEL POLLAJUOLO); Florentine architect; b. Oct. 30, 1457; d. 1508.

Simone was called Cronaca, the chronicler, from his endless stories about the Roman monuments. He was brought up as a woodworker, *intarsiatore*, spent much time in Rome, and acquired a thorough knowledge of the antiquities. The buildings which can with certainty be credited to him are in Florence and not very numerous. In 1489 he superintended work upon the roofs of the Duomo. In 1490 he was appointed *maestro dei scarpellini* at the Palazzo Strozzi, and in 1497 became architect of that building. Cronaca substituted plain stone for rustication in the last three courses, and designed the celebrated cornice of the Strozzi. At about this time he built the sacristy of Santo Spirito from the model by Giuliano da San Gallo (see San Gallo, G. da). The fine church of S. Salvatore al Monte (consecrated 1504) is attributed to Simone by Vasari. It was much admired by Michelangelo. June 23, 1495, Cronaca was made *capomaestro* of the Duomo, and after July 15, 1495, built the great hall of the Palazzo Vecchio, entirely remodelled by Vasari. Milanesi publishes a *Prospetto Cronologico della vita e delle opere di Cronaca* in his Vasari.

Geymuller-Stegmann, *Die Architektur der Ren. in Tosc.*; Vasari, Milanesi ed.; Muntz, *Renaissance*, Vol. II., 1891; Mazzanti-Badia, *Migliori Fabbriche di Firenze*; Fantozzi, *Nuova guida di Firenze*.

CROP; CROPE. A bunch of foliage worked or sculptured at the top of a spire, finial, or similar decorative member, and having a resemblance to the top or crop of a plant. (Compare Finial; Poppyhead.)

CROSS. *A.* A gibbet of the peculiar form employed by many ancient nations; the signification of the Latin *crux* having nothing to do with the exact form of the gibbet in question. N. E. D. approves the use of the English word in this primary signification. That especial gibbet upon which Christ was exposed is generally assumed to have been composed of a horizontal piece secured at right angles upon a high, upright piece of timber; hence the following definitions:

B. Any object consisting primarily of two straight or nearly straight pieces forming right angles with one another; whether a mere delineation on a flat surface or a solid, free-standing piece, or something partaking of both natures, is indifferent. Architecturally speaking, the cross may appear carved in stone cut through or into a wall in the form of a window, loophole, or mere sunk panel, or in the form of an upright emblematic addition forming no essential part of the architectural design, as upon the top of a spire, or standing upon a rood beam or rood screen at the entrance to a chancel or sanctuary. The cross may or may not bear the image of the crucified Saviour. When that image is not present, the cross may be taken as an emblem. (See Symbology.)

C. A monument or small building of any kind, surmounted by a cross in sense *B*, and of which the said cross forms a very important part. The portable objects, such as the staves carried by certain ecclesiastics and surmounted by a cross, belong under this definition, but are not subjects of architectural inquiry. (For the buildings, see City Cross and Market Cross, below; Cross of Queen Eleanor.)

D. An object conventionally assumed to be a representation or modification of a cross in sense *B*. Thus, a slight modification produces the *Cross Crossed*, a heraldic device in which each arm of the cross is formed again into a cross; the *Cross of Jerusalem*, in which each arm terminates in a crossbar so that each arm represents the capital T; the *Maltese Cross*, in which each of the four arms is like an arrowhead pointing inward; that is to say, it is a cross of eight points grouped in couples. None of these are of architectural importance, occurring as they do merely in heraldic and similar appliances. Many forms are employed in heraldry, and some few of these occur constantly in ordinary jewelry and the like. In painted architectural decoration, crosses in this sense and of many forms are freely employed mingled with other liturgical emblems.

(For the Irish Crosses, see bibliography under Ireland. For the use of the cross in church architecture and connected branches of art, see the bibliography under Gothic; Romanesque; Symbology.) — R. S.

Archiepiscopal Cross. One which, having the general character of the Latin cross, has two horizontal bars instead of one.

City Cross. In the Middle Ages, a structure with a raised platform from which public addresses could be made, laws and edicts proclaimed, and the like; usually, a steeplelike ornamental building ending in a cross. In some instances, this structure was high and elaborate enough to supply a pulpit or stand for the speaker, raised above the pavement at the base.

Consecration Cross. One used with others in the ceremony of consecrating a church. Such crosses were frequently made a part of the permanent interior decoration of a building.

Greek Cross. One which has the two bars of equal length and crossing one another in the middle, so that the four arms are equal. It is customary to speak of churches whose nave, choir, and transept arms are equal, or approximately equal, in length as built on the plan of a Greek cross.

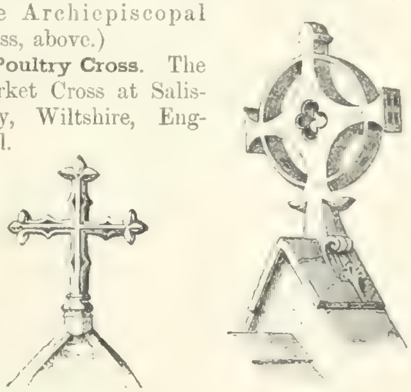
Latin Cross. One which has an upright much longer than the crossbar, or, in other words, which has three arms equal or nearly equal in length, and the fourth much longer. The ordinary Romanesque and Gothic church in Western Europe, and all the churches which succeeded the classical revival, and in which the nave is longer than the choir and much longer than either arm of the transept, is commonly spoken of as being built on the plan of a Latin cross.

Market Cross. Same as City Cross; the term arising from the common usage of locating such crosses in the principal market place of a town.

Memorial Cross. Any cross erected in memory of a person or event. (See Cross of Queen Eleanor; Cross of S. Louis.) Many City Crosses, Preaching Crosses, and the like were originally memorial crosses.

Papal Cross. A modification of the Latin Cross, having three horizontal arms. (Compare Archiepiscopal Cross, above.)

Poultry Cross. The Market Cross at Salisbury, Wiltshire, England.



Crosses as Finials over Gables.

Prayer Cross. One erected in a village or at the crossing of important roads, or the like; generally, with a small altar at which mass could be said on certain occasions, and with a figure of Christ or a group of the Virgin and Child. A very few of these still exist, at least in part; one is mentioned as standing at Royat (Puy de Dôme). A few of these were in bronze, and drawings of some have been preserved.

Preaching Cross. A cross erected by the roadside, or in the market place of a town, generally upon a stone platform, approached by a few steps, called a Calvary, where monks or friars could address the people. It was generally a simple structure, the cross forming the finial of a stone shaft. In market places, however, the preaching cross was often a polygonal building richly decorated with an open vaulted story below, and a spire above with pinnacles and statues. Memorial crosses were, on occasion at least, preaching crosses. (See above, City Cross; Market Cross.)

Queen's Cross. (See Cross of Queen Eleanor.)

S Andrew's Cross. A saltire, that is a cross with four equal arms, but set diagonally.

Tau Cross. An object having the form of a capital T, associated with certain early mysteries of faith which were perhaps derived from the Ankh.

Wayside Cross. A cross erected by the side of a road in Roman Catholic countries as a station for prayer, or to commemorate a local event, as a murder or other tragedy. (See above, Preaching Cross.)

CROSS CHURCH. A cruciform church; that is, a church with transepts which project on either side, producing a cross-shaped ground-plan.

CROSSET; CROSSETTE. *A.* A lateral projection of the architrave mouldings of classic doors and windows at the extremities of the lintel or head; they appear to have originated in Asia Minor, as reminiscences of the projection of the ends of the lintel beyond the doorposts; are found occasionally in Greek and Roman architecture, and frequently in Renaissance and modern buildings. The most elegant are those formed by returning one or two of the outer bands and all the mouldings of the architrave around a slight projection of the inmost band. Called also Ancones and Prothyrides.

B. The projecting ears or lugs of joggled voussoirs and keystones.

Written also croisette and crosette. — A. D. F. H.

CROSS GARNET. (See under Hinge.)

CROSSGRAINED. Having the grain transverse or oblique to the length; used particularly of boards in which, owing to the crookedness of the log from which they are cut, the grain lies diagonally or crooked in the plane or in the width of the board, such stuff being liable to chip under the plane, and difficult to work.

CROSSING. In a cruciform church or similar structure, the open square made by the intersection of the transept with the nave and choir; also that intersection in general, as at the ridges of the roofs in cases where there is no central tower.

CROSS LIGHT. *A.* Light received from windows in walls at right angles to each other and so distinguished from Counter Light from windows in opposite walls; and

B. The same as Counter Light. Restriction to the first sense is more scientific. In this sense cross light is permissible from the side and rear in audience rooms and class rooms, but should on no account be allowed from side and front. (See Lighting.)

CROSS OF QUEEN ELEANOR. One of those erected as memorials of Eleanor of Castille, queen of Edward I. (died in Lincolnshire, 1290). The body was embalmed, and the funeral procession set out for London. The procession rested at Lincoln, Grantham, Stamford, Geddington, Northampton, Stony-Stratford, Woburn, Dunstable, Saint Albans, Waltham, East-Cheap (London), and Charing (now Charing Cross, London). The list is given with slight variations by different authorities. At each of these points a stone cross was erected by the king. The architects or masons employed were Richard de Stowe, John de Battle, Dymenge de Legeri, Michael de Canterbury, Richard de Crundale, and Roger de Crundale. The crosses at Northampton, Waltham, and Geddington still remain.

The cross at Charing having been destroyed in 1647, was replaced, about 1863 by a careful reproduction of the original so far as its design had been preserved. The new cross stands a few yards east of the original site.

R. Gough, in *Vetusta Monumenta*, Vol. III.; Hunter, *On the Death of Queen Eleanor of Castille*, in *Archæologia*, Vol. XXIX., p. 167; Britton, *An Essay towards a History and Description of Ancient Stone Crosses; Architectural Antiquities*, Vol. I.

— R. S.

CROSS OF S. LOUIS. One of those erected by the sons of S. Louis, king of France, when bringing the body of their father from Paris to Saint Denis.

CROWDE. A crypt or cellar: especially of a church; obsolete since the seventeenth century in all its forms, as crowd, croude, shroud, and also in the plural, as "the crowdes."

CROWFOOT. On a drawing, plot, or the like, a V-shaped mark, like an arrowhead, to indicate, by the location of its point, the line, surface, or point from or to which a certain dimension is to be taken, — as at each end of a reference line, — or to which a written or printed note or direction may refer. (Called also Crow's-foot.)

CROWN. *A.* The head of anything, especially of an arch or vault. Like Haunch (which see), the term is applied to a part of an arch which cannot be limited exactly. By extension, used attributively, as crown cornice, crown moulding, and the like.

B. A decorative termination, as of a tower or turret, which is assumed to resemble a crown in the common sense, such as finished the well-known tower of S. Dunstan's church in the city of London. In this, the steeple is replaced by four flying buttresses each starting from a pinnacle and meeting in the middle; where they carry a small, very slender spire which rests entirely upon these open arches. The church of S. Giles in Edinburgh, which dates from a much earlier time than the London tower, has eight arches springing from the four corners and the axes of the four faces of the tower, and these carry a lanternlike steeple of considerable elaboration, the whole structure being a singularly effective piece of the very latest Gothic feeling lingering in the sixteenth century. — R. S.

CROWNING. *A.* The operation, and the result, of forming anything with a slight convexity upward. Crowning is practised in laying floors of broad span, especially to sustain heavy strains, in order to offset the sagging likely to result in time; upon roadways to secure a proper drainage to the gutters. (See Camber; Crown-up.)

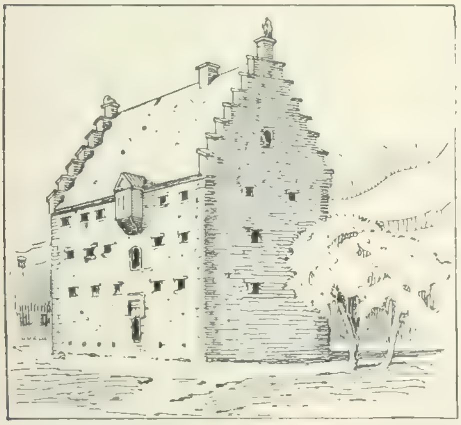
B. The termination of the upper part of a building by a suitable decorative feature such as a cornice, pediment, or finial.

CROWN STEEPLE. Same as Crown, *B.*

CROWN-UP (v.). To give an upward tending convexity (to anything). A road or so-called *flat* roof is said to be crowned-up when the middle is made higher than the sides. (See Camber.) In Gothic vaulting it was at certain epochs customary to crown-up each compartment of the vault, giving to the middle, the point where the diagonal arches cross and where the boss was situated, an elevation greater than that of the points of the transverse and wall arches.

CROW-QUILL. A small, sharp-pointed steel drawing pen, having the barrel holder and pen in one piece; supposed to replace the small quill pen made from a crow feather, anciently employed for very fine free-hand drawing in line.

CROW'S-FOOT. Same as Crowfoot.



Crow Steps: Glimmingehus, Scania, Sweden.

CROW STEP. Any one of the steps of a stepped gable. (Called also Cat Step, Corbel Step, and Corbie Step.)

CROW STONE. The capstone of a gable upon which is set the finial cross or pinnacle.

CRUCIFIX. A Latin cross bearing the image of Christ. Its use in architectural dispositions is limited to the placing of the Rood on the Chancel Screen, which takes thence the name Rood Screen, and the sculptures of a Calvary, or a Wayside Cross or Market Cross. There are, however, a few instances of a rudely carved crucifix built into a church wall.

CRUCIFORM. Shaped like a cross; *i.e.*, with four arms at right angles. (See Cross; Cross Church.)

CRUCK. Same as Crutch.

CRUNDALE, RICHARD DE; architect; d. 1292 or 1293.

Richard de Crundale built, and probably designed, the Eleanor Cross which was situated in the village of Charing, now the region called Charing Cross in London. After his death the work was continued by Roger de Crundale (see Cross of Queen Eleanor). Richard de Crundale did the marble work of the monument of Queen Eleanor in the chapel of Edward the Confessor in Westminster Abbey, and was employed on the works at the palace of Westminster.

Joseph Hunter, *On the Death of Eleanor of Castille* in *Archæologia*, Vol. XXIX., p. 167.

CRUNDALE, ROGER DE; architect.

In 1292–1293 Roger de Crundale succeeded Richard de Crundale as architect of the Eleanor Cross, which formerly stood at Charing, now Charing Cross (London). He was also employed on the Eleanor Cross at Waltham (Essex, England).

Hunter, *On the Death of Eleanor of Castille*, in *Archæologia*, Vol. XXIX., p. 167.

CRUSHING FORCE; LOAD; WEIGHT. That kind of weight or force which acts or tends to act by crushing or compressing the parts of a member or material. In technical usage, commonly limited to such a load tending to rupture the resisting material by its direct pressure, such material considered as not being subject to breaking by flexure, buckling, or the like. (See Resistance; Strength of Materials.)

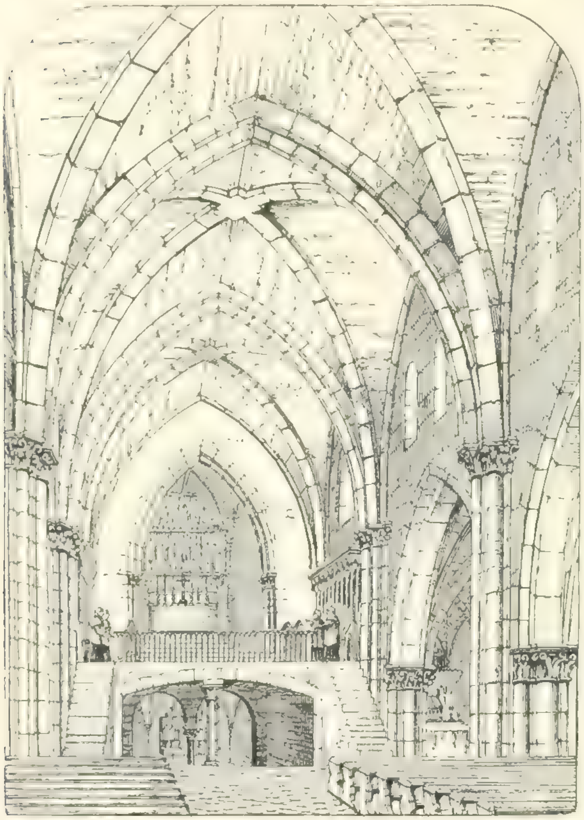
CRUSH ROOM. A room, spacious lobby, or salon in a theatre, opera house, or other place of entertainment, provided for promenading and conversation between the acts or during intermissions in the entertainment. The term is more general in Great Britain than in the United States, where the French word *foyer* is more commonly employed.

CRUTCH. In England, one of a pair of inclined timbers joined at the top and connected by one or two tie beams, the resulting frame forming the unit in the framework of early houses. Such pairs of crutches were placed at more or less regular distances apart, the included space being known as a bay. (See Wood, Construction in, Part I.)

CRYPT. Properly, something concealed; hence, —

A. A room, whether used merely as a place of burial and reverenced when containing the ashes of a sanctified person, or used as an oratory or chapel. By extension, —

B. A story beneath the pavement of a larger or more important upper church. It frequently happens that the crypt remains from some much earlier building, and that the tower structure has been built around and above it without serious alteration of the old crypt. On this account much of our knowledge of the earliest Romanesque architecture is derived from these small, generally simple, and much-frequented sanctuaries. The term "crypt" is sometimes extended to signify the lower story of a two-storied building; thus, the lower chapel of the Sainte Chapelle at Paris, and of the church of S. Francesco at Assisi have been called crypts, and the overground crypt of S. Etheldreda's chapel in London, which is all that remains of the great episcopal palace called Ely Place, is of exactly the same character as that of the Sainte Chapelle; that is to say, its vaults are used to carry the floor of the principal chapel on the level of the chief remains of the palace — the ground floor (crypt) being thus left for special services at special times, or for the use of non-residents, or for the daily attendance of the servants of the palace. — R. S.



Crypt: Cathedral of S. Lucius, Chur, Switzerland.

The choir is approached by the two flights of steps, between which is the entrance to the crypt below.

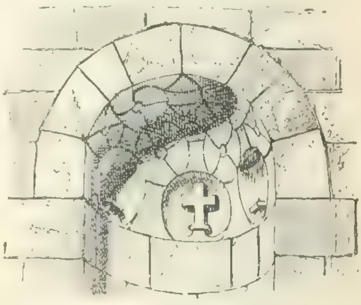
CRYPTOPORTICUS. A roofed or vaulted passageway or corridor, sometimes, but not always, underground, serving either as a sheltered promenade, or as a private communication between separate portions of a villa, palace, or thermæ in ancient Roman architecture. The service of the great thermæ was largely carried on by their means. Imposing ruins of such passages remain in the Villa Hadriana at Tivoli, and on the Palatine Hill by the palace of Caligula. Pliny describes several in his villa at Laurentium (Ep. II., 17) which were wholly above ground. — A. D. F. H.

CRYSTAL PALACE. An exhibition building composed in large part of iron and glass; a popular term. The original one was that built in Hyde Park, London, for the great exhibition of 1851, the first international exhibition. The name was then extended to the great building at Sydenham, southwest of London, and, though less universally, to the New York exhibition building which stood on what is now Bryant Park, at Sixth Avenue and Forty-second Street.

CUBCILE. A bedroom or chamber; a word rarely used except in translating the Latin *cubiculum*, or in poetic or classic allusions. (See Etruscan Architecture.)

CUBICULUM. *A.* In Roman architecture, a bedchamber or reclining room. Those in ordinary Roman houses, as at Pompeii, were of small size, lighted only through the door or by artificial light, and were entered directly from the court. In one instance, at least, there are very small window openings high in the wall, and in some cases there is a relatively large door on the court, and a smaller door in addition. Owing to their small size they must have been but scantily furnished, though often beautifully decorated with wall paintings. They were mere sleeping cells, wholly unlike the modern bedroom.

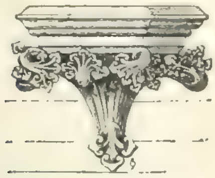
B. By extension, from *A*, a small enclosed space of any kind, in a building; as a specially enclosed box at a Roman theatre, or the like. Used by Vitruvius to designate the recesses in walls to receive the ends of beams (IV., 2). — A. D. F. H.



Cul de Four, formed by the Top of a Niche: Cathedral of Bosra, Syria.

CUL DE FOUR. In French architecture, a half dome, or quarter sphere vault, as over an apse or niche; misapplied in English sometimes to completely hemispherical vaults.

CUL DE LAMPE. *A.* An isolated corbel serving as a support for an oriel, turret, statue, column, or the like; particularly one having a mass resembling an inverted pyramid or cone.



Cul de Lampe (Bracket): S. Stephen's Chapel, Westminster.

B. A conical, convexly rounded or pyramidal lower termination of a pendant, a newel post, or the like.

The term is of French origin, probably derived from a fancied resemblance to the bottom of a hanging lamp.

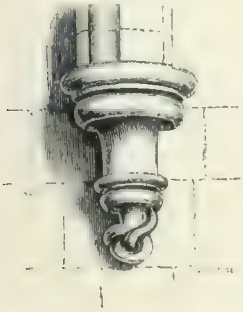
CUL DE SAC. A street, passage, or alley having only one issue, *i.e.*, closed at the further end and without branches or cross streets. Properly speaking, the *cul de sac* is the remote end or closed portion of such a passage or *impasse*.

CULINA. In Latin, a kitchen in the sense of a room especially appropriated to cooking; differing from the atrium, in which, in early times, was situated the hearth where all the cooking was done. In Pompeii, some rooms exist which may be called either atrium or culina, as they are open with the compluvium, while there exists another atrium without a hearth.

CULL LUMBER. (Abbreviated often as culls.) Inferior material; wood of the lowest grade and not fit for the usual purposes of construction. The term is used loosely in the lumber trade, the exact meaning varying in different parts of the country. Specifically, the inferior lumber not sufficiently good to be graded in one of the standard classes.

CULMIS, DE. (See Dechaume, Nicolas.)

CULVER HOLE. An aperture in masonry to receive the end of a timber. (Compare Culver House.)



Cul de Lampe (Bracket) from Church at East Dereham, Norfolk.

CULVER HOUSE. A dovecote or pigeon house. The old word for a pigeon, culver, gives this term and also Culver Hole, Culver Tail.

CULVERT. A passage or tunnel under an embankment or the like for the passage of water. Generally constructed of masonry and arched. It serves the purposes of a drain, from which it differs as being larger and of more elaborate construction. Distinguished from a bridge as being a very subordinate part of the general structure.

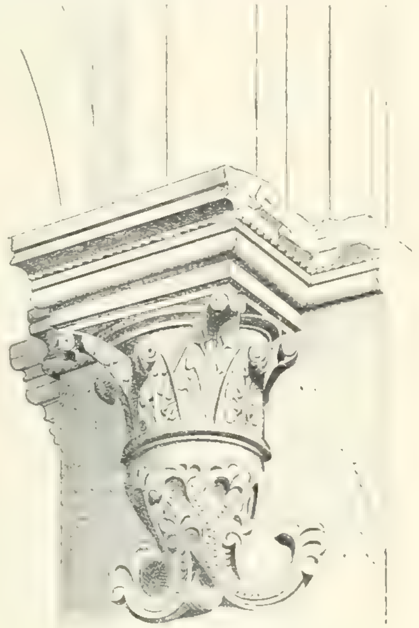
CULVER TAIL. A dovetail. (See Culver House.)

CUM. (In Latin, *with*, the preposition); in English ecclesiological use, denoting the combination of two parishes into one; in such phrases as Bolton-cum-Stowe.

CUM CEILING. Same as Camp Ceiling; a corrupt form, prevalent in England, and sometimes used to designate simply the sloping part of an attic ceiling.

CUNEUS. *A.* Literally, a wedge; a Latin term for the wedge-shaped or trapezoidal bodies of seats between the aisles or *climaces* of ancient theatres or amphitheatres.

B. In the writings of Vitruvius, a species of zigzag or fret painted on flat bands.



Cul de Lampe.

CUNICULUS. A low underground passage, as to a burial chamber of an Etruscan tomb.

CUNNINGHAM, GENERAL SIR ALEXANDER, K. C. I. E.; archæologist: b. 1814; d. Nov. 28, 1893.

In 1831 he entered the service of the East India Company, and from 1840 to 1860 held the important office of constructor of public works in the Indian army. He won special distinction in the Sikh campaign of 1846. In 1858 he was appointed chief engineer of the northwest provinces. In 1846–1847 he published *The Temples of Kashmir and Ladakh, Physical, Statistical, Historical*. In 1861 Cunningham was intrusted by the viceroy with the Archæological Survey of India, and continued that work until his retirement in 1885. In 1871 he published *Ancient Geography of India*, and in 1892 his work on Gaya.

Obituary in *Journal R. I. B. A.*, 1893–1894, p. 77).

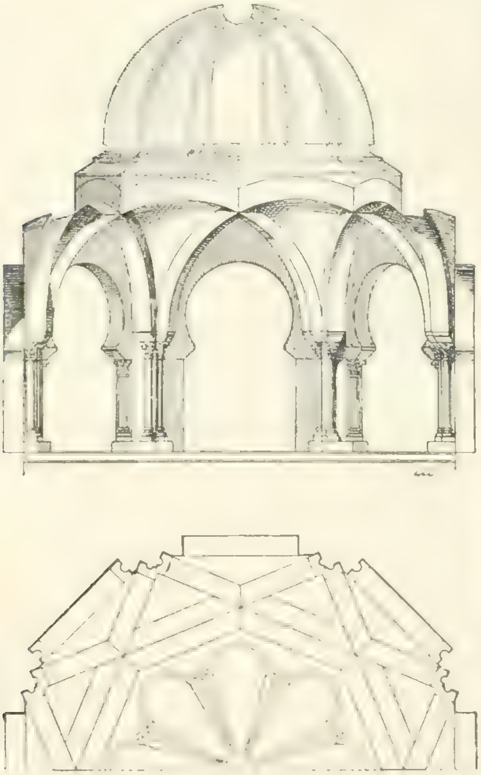
CUNTZ, architect.

Cuntz appears as architect of the cathedral of Strasburg in 1382. He was succeeded by Michael von Freibourg (see Michael von Freibourg). He probably built the screen connecting the two towers in the third story of the façade.

Gérard, *Les Artistes de l'Alsace*.

CUPBOARD. Originally a set of shelves upon which dishes, silver plate, and the like could be displayed; by transition, and as the decorative piece of furniture in question has disappeared from use, a small and shallow closet.

CUPOLA. *A.* A bowl-shaped vault; and the imitation of such a vault in lighter materials. The significance of the term is in its form, and while it is erroneous to speak of a lath and plaster imitation of a Gothic roof as a *vault*, it is still correct to call a bowl-shaped roof a cupola even if it is hung from the roof timbers. A distinction is then to be made between (1) those cupolas which are of solid construction as in the Pantheon at Rome, about 142 feet internal diameter; the cathedral at Florence, about 141 feet; the church of S. Peter at Rome, about 139 feet; the ruined laconicum of the thermæ of Caracalla, about 126 feet; the mosque of S. Sophia at Constantinople, about 100 feet; and the mausoleum of Sultan Mahmud at Bijapur in northern India, which appears to be 124 feet wide, and is built on such terms of construction as to make it a marvel of lightness.



Cupola over the Mihrab of the Mosque at Cordova, Spain.

In all these cases the support of the cup-shaped vault, as by Pendentives or by a Drum, is of especial importance.

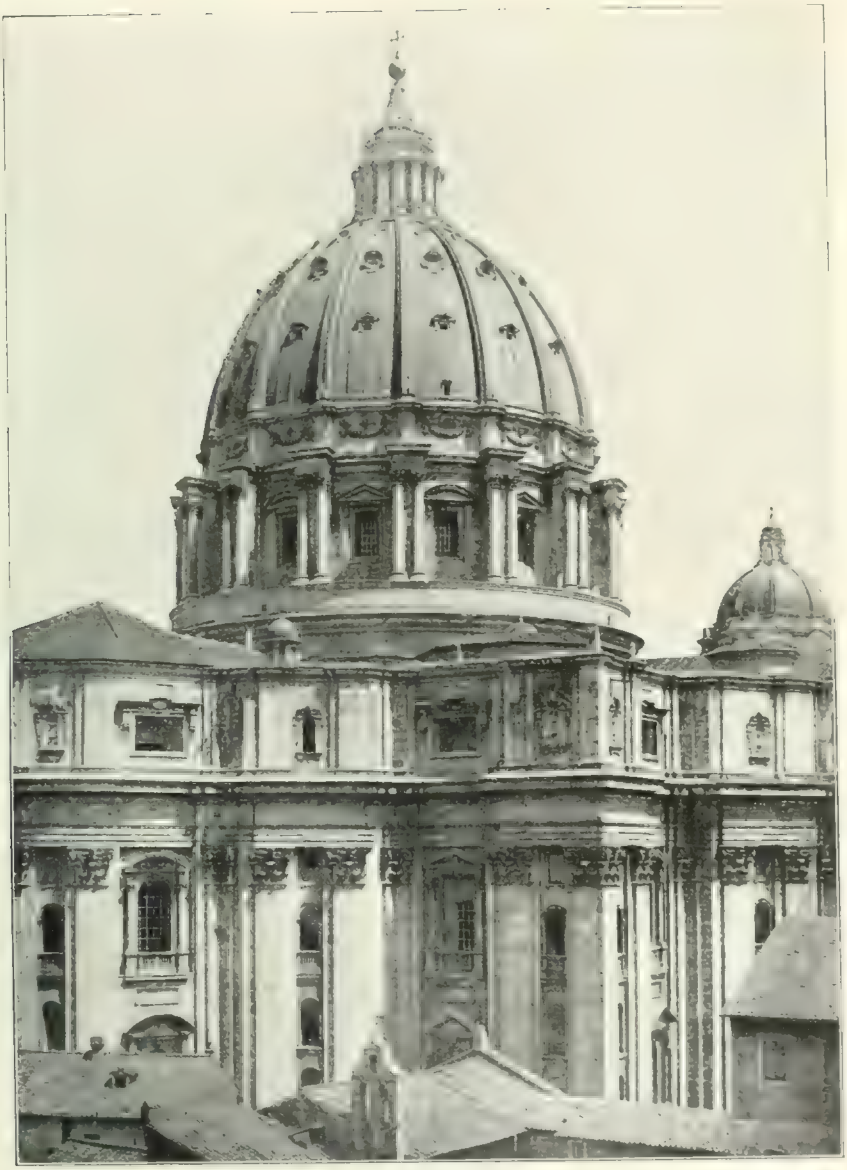
(2) Those cupolas which are partly of masonry; thus, the cathedral of S. Paul, in London, has the innermost curved ceiling, which is visible from the pavement, of solid masonry; and the haunches of this support a cone of brick which carries very sufficiently the lofty and elaborate stone lantern; but the rounded outer shell of the cupola is of wood and lead, resting upon the circular drum of stone and upon the brick cone. The *Dôme des Invalides* in Paris, where now is the tomb of Napoleon I.; built in a similar way of wood above two inner structures of stone, but having in this case a wooden lantern also. The church of the Val-de-Grâce, in Paris; of beautiful contour, but similar in structure. The church of S. Mark at Venice, which has five masonry cupolas seen from within, the largest about 47 feet span, and each of these capped by a high outer shell of wood and metal.

(3) Those cupolas which are not of masonry in any part, but, if of any pretensions to size or permanence, usually of iron. Of these, the most interesting are those of the Halle au Blé at Paris (for which see Iron Construction). Capitol at Washington; of great dimensions and built out in an ingenious way beyond and around the original drum of masonry. That of the Paris Exhibition of 1878, somewhat more than 100 feet in diameter, and an admirable piece of engineering. That of the Paris Exhibition of 1889, nearly as large and very successful in design.

There are also the cupolas of special character, such as those of wrought iron with the spaces filled in with tile which roof the reading-room of the Bibliothèque Nationale at Paris. These are not large, having each only about 32 feet diameter, but nine of them are combined in one roof; the supports being four slender wrought iron columns, and twelve piers built into the outer walls of the room. In like manner, the later Byzantine buildings of Greece and other parts of the Levant, and those imitations of the Byzantine style which constitute a large part of Russian architecture, have cupolas of which the drums are singularly lofty, and are pierced with elaborate systems of windows, while the cupola proper or rounded part becomes a mere roof to a tall cylindrical shaft.

B. In popular usage, a small structure built upon a roof either for a lookout or to complete a design. Such buildings are commonly

PLATE XXV



CUPOLA

That of S. Peter's church at Rome, seen from the northwest, which is in this church that which the northeast would be in a church if the usual orientation were followed. The cupola, the design of which is ascribed to Michelangelo, owes much, it is probable, to the work of Vignola. It is one of the three great cupolas of the world, a little smaller horizontally than that of Florence cathedral, but raised much higher above the site. It is built entirely of stone, and the interior is faced with mosaic, presenting, when seen from the church floor below, a more imposing and graceful effect than any similar structure in Europe.

of the nature of a lantern having windows on all sides, and being lightly built. In some cases, however, they protect the heads of winding staircases and are then more massive, with, perhaps, a single opening serving as doorway of exit to the roof.

Isabelle, *Les Édifices circulaires et les Dômes*; Gosset, *Les Coupoles d'Orient et d'Occident*; Choisy, *L'Art de bâtir chez les Romains*; Choisy, *L'Art de bâtir chez les Byzantins*.

— R. S.

CUPOLATED. Having one or more cupolas, or formed like a cupola or series of cupolas.

CURB. A piece or series of pieces along the edge of a structure to protect, strengthen, or retain other parts or materials, especially when rising above an adjoining level. Specifically: —

A. A dwarf wall or similar structure, acting more or less as a retaining wall; as the upper part of the wall surrounding a well and which projects above the ground: a well curb.

B. A line of vertical stones along the edge of a sidewalk, often called curbstone, or collectively, curbstones.

C. A retaining member or belt, forming a ring at the base of a dome, as an iron framework, or connected stones of a course.

D. A similar horizontal member set between two successive slopes of a roof, retaining the feet of the upper tier of timbers (hence Curb Roof, which see under Roof); a coaming.

— D. N. B. S.

CURBSTONE. A stone forming a curb or part of a curb, or intended for that purpose. (See Curb, *B*.)

CURF. An incision, groove, or cut made by a saw or other cutting tool, especially one across the width of a board or moulding, usually for the purpose of facilitating its being bent to a curve. Chimneys and piers which have leaned from the vertical are sometimes restored to verticality by cutting a curf in the side from which they lean. In shaping a square timber from the log by hewing, it is common first to cut along one side of the log a series of curfs; that is, notches, the depth of which is regulated so as to form a gauge for the subsequent cutting away of the wood between. (Written also Kerf.)

CURIA. A structure intended for the use of a tribal court, one of those provided for the early organization of the Romans; hence, at a later time, a building occupied by the Senate. It took different forms and was embodied in different structures, as described in the following articles.

CURIA CORNELIA. Built after the destruction of the Curia Hostilia, but soon after destroyed in the reign of Augustus

CURIA HOSTILIA. A building traditionally ascribed to a king of Rome, Tullus Hostilius, who is thought to have produced it by altering and enlarging a temple. This building was destroyed by accident in 52 B.C.

CURIA JULIA. Built by Augustus, though perhaps begun during the lifetime of Julius. This building, although altered by Domitian, seems to have remained undestroyed until the reign of Diocletian, and the building of the fourth century has been identified with the church of S. Adriano on the northeast side of the Forum. The plan of the building with its appendages, as probably left by Diocletian, is given by Lanciani (*Ruins and Excavations of Ancient Rome*), and references are given to other works. The actual meeting room was not very large, apparently 55 by 82 feet, nor was it considered a splendid building. Some vestige of earlier republican simplicity carried to affectation prevented any approach to the complicated and splendid character of modern legislative buildings; at the same time it is not clear what were the accommodations for the business of the Senate apart from its general sessions, as for its committee work and the like.

CURRADI, RAFFAELE; sculptor.

A sculptor who was employed by Cosimo II. de' Medici, Duke of Florence, to decorate the Pitti Palace and the Boboli Gardens. He was noted for his skill in working porphyry. The grotesques which he made for the portal of the Palazzo Fenzi, Florence, are especially fine.

Gurlitt, *Geschichte des Barockstiles in Italien*; Ebe, *Spät-Renaissance*; Ebe, *Schmuckformen der Monumentalbauten*.

CURTAIL. In stair building, the outward curving portion of the hand rail and of the outer end of the lower step or steps of a flight; possibly an abbreviation of curved tail. An ample curtail to the lowest two or three steps not only enhances their appearance, but offers an easier start to persons approaching from the side. A plain semicircular curtail to the lowest step is called a bull nose. (See these terms under Step.)

CURTAIN (I.). *A*. In fortification, the wall between two towers or bastions, and in this sense accurately descriptive of a part of the defensive works.

B. By extension, in a building having pavilions, projecting masses, and the like, the flat wall between any two such masses. (See Curtain Wall.)

CURTAIN (II.). A hanging, usually of soft and pliant material, and usually for screening, protecting, or hiding something, or for closing an opening, as a doorway. Those which hang in the church doorways of Europe are often of leather, and heavily lined and stuffed; but curtains generally are assumed to be easily movable, and even capable of being compressed into narrow folds, for which purpose they are hung to rings which slide on a rod.

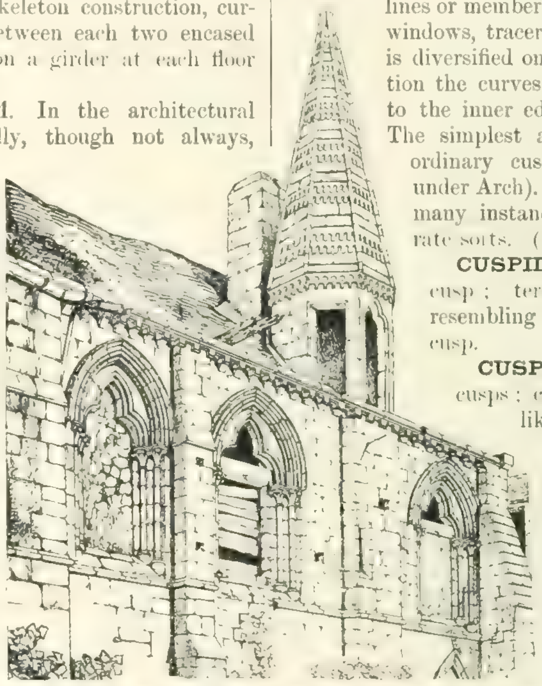
CURTAIN WALL. A portion of wall contained between two advancing structures, such as wings, pavilions, bastions, or turrets. The term indicates position, and not character or function. A curtain wall may be a mere screen, as to a court or yard, or a part of a façade; it may be solid or fenestrated, either higher or lower than its flanking structures, or of the same height.

In modern construction, most often a thin subordinate wall between two piers or other supporting members; the curtain being primarily a filling and having no share — or but little — in the support of other portions of the structure. Thus, in skeleton construction, curtain walls are built between each two encased columns and usually on a girder at each floor level or thereabouts.

CURTILAGE. *A.* In the architectural sense, a court, usually, though not always, understood to be of small size. (Rare or obsolete.)

B. In the modern legal sense, the ground adjacent to a dwelling house and appertaining to it, as yard, garden, or court.

CURVE. In architectural drawing, a thin piece of wood, metal, hard rubber, or like material, cut to an outline of varied curvature for laying out, in a drawing, curves not to be produced with the ordinary forms of compasses; either because they are *not* arcs of circles, or because they are circular arcs of very long radius. Sets of special curves are used in ship drafting and railway plotting; one or two pieces usually suffice for the architect, each having a considerable variety of curves in its outline. Sometimes called French curve and set curve. (See Spline.)



Cusp: Part of the Gendarmerie Impériale, Caen (Calvados), France.

The large windows and one in the turret adorned with solid cusps

CUSHION. A rounded projection of a part not commonly of that form; as in later classic, a frieze or part of a frieze projecting in a convex curve. (Compare Pulvination.)

CUSHION CAPITAL. A type of capital common in Norman and Romanesque work, tenth to thirteenth centuries, in England and Germany, and to some extent in France, having an approximately cubical form with the lower part rounded off to meet the shaft, and a moulded abacus. The flat part is sometimes carved, oftener plain. In later examples the lower part is more tapering, and divided into four or even more clustered conical masses. They appear to have been evolved out of the conditions and limitations of the crude early work. In early Christian and Byzantine architecture certain heavy inverted pyramidal capitals approximate the type, but appear to be degenerate Corinthian capitals. (See Capital; Impost Block.) — A. D. F. H.

CUSHION RAFTER. Same as Auxiliary Rafter, under Rafter.

CUSP. Properly a point; in architecture, a point made by the intersection of two curved lines or members; especially in Gothic windows, tracery, etc., where the arch is diversified on its intrados by foliation the curves of which are tangent to the inner edge of the larger arch. The simplest are those seen in the ordinary cusped arch (which see under Arch). Gothic tracery affords many instances of the more elaborate sorts. (Cuts, cols. 733, 734.)

CUSPIDAL. Formed like a cusp; terminating in a cusp; resembling or pertaining to a cusp.

CUSPIDATE (adj.). Having cusps; composed of, or formed like a cusp or cusps.

CUSPIDATE (v. t.). To furnish with a cusp or cusps; to make in the form of a cusp or cusps.

CUSPIDATION. A system of ornamentation consisting of or containing cusps, the tracery of Gothic architecture depending largely upon this.

CUSTOMHOUSE. A building in which are the offices for the reckoning and calculations of customs duties. One of the earliest buildings erected for the purpose is the Dogana of Venice. Modern customhouses built by the great commercial nations in their principal seaports are of great size and complexity of plan.

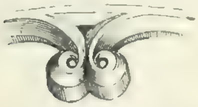
CUT BRACKET. A bracket-shaped piece of board used either as a shelf support or true bracket; or as an ornament, as under the projecting end nosings of the treads in an open-string stair. This latter finish is common in "Colonial" houses in the United States. (See Bracketed String, under String.)

CUT-OUT, FUSIBLE. (See Electrical Appliances.)

CUT SPLAY. An oblique cutting of a brick to fit a slope, a splay, or the like, as at the corners of an octagonal structure, a splayed doorway, or the edge of a gable to receive the coping.

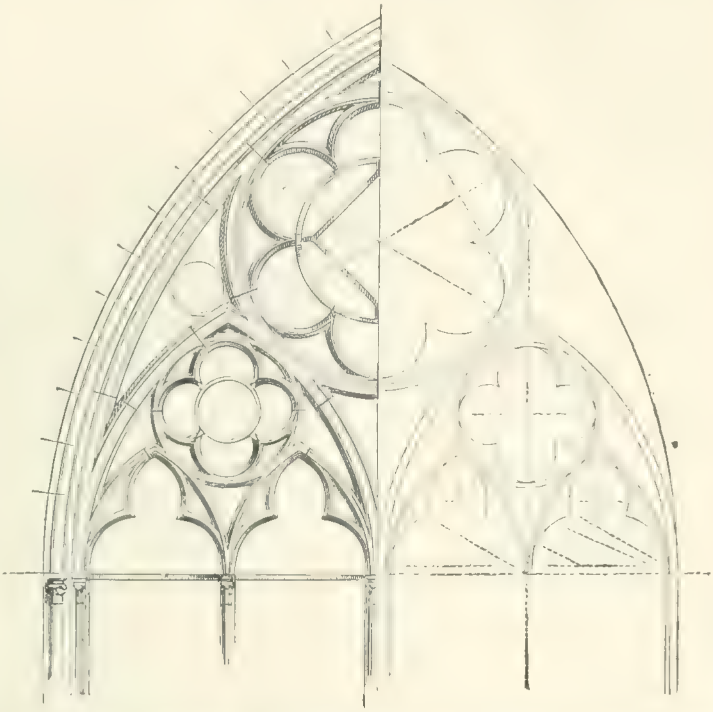
CUT STANDARD. The solid vertical side, or standard of a case of shelves, when cut to some ornamental outline, as for a bookcase or for shelves of diminishing width in an *étagère*, or the like.

CUT STONE. Stone accurately shaped for the place it is to occupy in the wall, vault, or other construction, having carefully cut beds and joints, and a face more or less smoothed to the general surface of the wall. (See Stereotomy; Stone Cutting.)



Cusp: Early Decorated; Solihull Church, Warwickshire.

The cusp is pierced, and ends not in a point but in two reversed spirals, — a rare form.

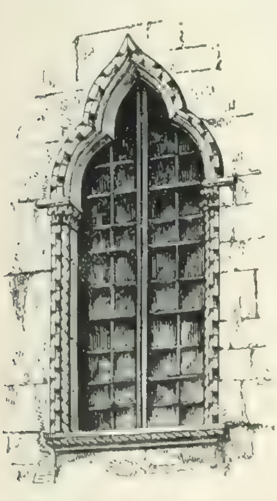


Cusp: Gothic Traceried Window; Late 14th Century (Notre Dame, Paris).

All the decorative effect being derived from pierced cusps.

CUVILLIÉS, FRANÇOIS DE (I.); architect, decorator, and engraver; b. 1698 (at Soissons, Aisne, France); d. about 1767.

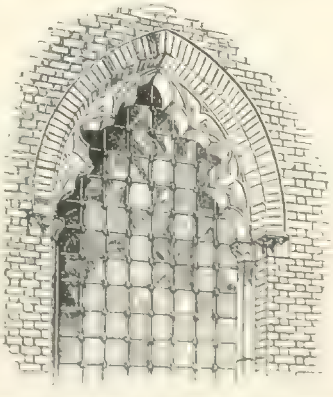
He came to Paris in 1714 and entered the atelier of Robert de Cotte (see Cotte, R. de). Sept. 15, 1725, he was appointed *Hofbaumeister* to the Elector Karl Albrecht (of Bavaria). After Dec. 13, 1763, he assumed the direction of all the Elector's constructions. When Karl Albrecht became emperor as Karl VII. (Jan. 24, 1742), Cuvilliés was made *Hofkammerrath* and *Hofbaumeister* at the imperial court. He built the *Lustschloss* at Nymphenburg near Munich. It is probable that he designed the *Residenz-theater* in Munich, which was begun April 15, 1751, and is one of the finest examples of the French baroque style in Germany. He made extensive additions to the *Residenz* (Royal Palace) at Munich. Cuvilliés excelled in the arrangement of parks and gardens. A catalogue of his numerous works on art and decoration and of his many engravings is given by Destailleur and Bérard (op. cit.).



Cusp: Domestic Window, Verona.

The back of the archivolt cut away, following the lines of the cusped intrados.

Seidel, *Die Königliche Residenz in München*; Destailleur, *Notices sur quelques artistes français*; Bérard, *Catalogue de l'œuvre des Cuvilliés père et fils.*



Cusp: Window in S. Stefano, Venice.

Double-cusped [illegible] arch.

CUVILLIÉS, FRANÇOIS DE (II.); architect, engraver, and decorator; b. 1731 (at Munich, Bavaria); d. about 1805.

A son of François de Cuvilliés (I.) (see Cuvilliés, Fr. I.). He succeeded his father as architect of the Bavarian court. He edited his father's works in 1773, and published a Bavarian Vignola and studies of monuments, fountains, palaces, tombs, bridges, etc.

For bibliography, see Cuvilliés, Fr. (I.) de.

CYANOTYPE. *A.* The process of making prints on paper direct from a drawing or print on translucent paper or cloth. Paper is coated with a mixture of ammonia, citrate of iron, and potassium ferrocyanide. On exposure to light this is changed to insoluble Prussian blue; while the lines of the drawing are left in white or a much paler blue. The blue print is immersed in a bath of clear water and becomes fixed by simply washing away all soluble matter.

B. A print made by the above described process. (See Sun Print.)

CYCLOIDAL ARCH. An arch of cycloidal outline, having for intrados of each side the curve described by a point of a circle rolling along the rise of the arch, the diameter of the circle being half the span of the arch. Such arches are very exceptional. — (A. P. S.)

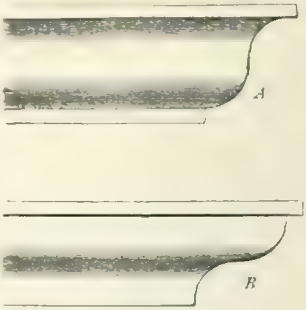
CYCLONE CELLAR. A kind of dugout or underground retreat constructed in the plain region of the United States as a refuge from cyclones. — F. S. D.

CYCLOPEAN (adj.). In ancient stone masonry, rude and of uncertain date; usually applied to a structure composed of stones of irregular form which have been fitted to one another by more or less rough dressing. The rudest work of this kind is that common in prehistoric work in Greece, in which the stones are almost without shape, and their arrangement seems wholly accidental, small pieces being used to fill up the spaces between the larger masses. A more advanced kind of masonry shows a face composed of irregular polygons. (See Polygonal Building.)

CYCLOPEAN ARCHITECTURE or **BUILDING.** A primitive method of stone construction used in prehistoric times in Asia Minor, Syria, Greece, the Islands, and Italy. It was so named by Greek writers from the Cyclopes, a race supposed to be inventors and constructors, and was noted for the immense size, unfinished state, and irregular form of its masses, and for the use of small stones and clay mortar to fill in the interstices. As Cyclopean is merely a term for the earliest phase of Pelasgic architecture, all historic details are given under that heading. — A. L. F. Jr.

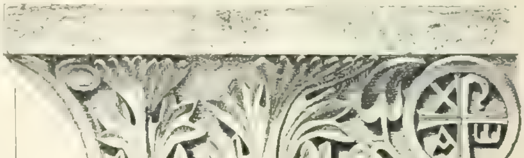
CYCLOSTYLAR. Characterizing a circular colonnade or peristyle; usually one having no cella or enclosed central structure; monopteral, like the *Temple d'Amour* at Versailles.

CYMA. A projecting moulding, common in classic architecture and its derivatives, having an ogee profile, consisting usually of a convex and an equal concave arc, each nearly, or quite, a quarter round. There is usually a vertical fillet above and below the ogee. When the curve starts outward and *upward* from the vertical with the convex part first it is called a *cyma recta*, — with the concave part first, it is a *cyma reversa*. When the moulding starts outward and *downward* it becomes an inverted cyma (recta or reversa). The cyma recta is the usual profile for the cymatium or crown moulding of a cornice; the cyma reversa is common in bed moulds and as an exterior moulding or tænia for architraves; in modern work, especially in carpentry and joinery, it is known as an ogee, and is in common use as a stock moulding, quirked or plain filleted. The cyma is not common in mediæval architecture. (See Moulding; Ogee; Profile.) — A. D. F. H.



CYMA.
A, recta; *B*, reversa.

CYMATIUM. *A.* A moulding named by Vitruvius, presumably a cyma, but perhaps not always or necessarily of any one given profile.

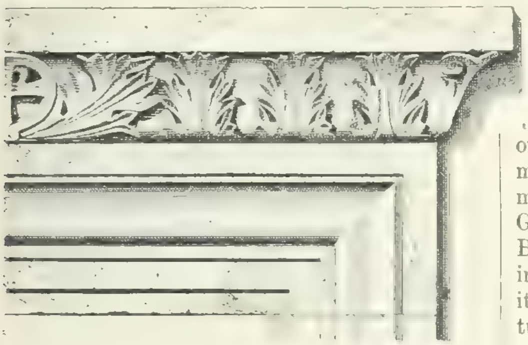


CYMATIUM FROM A HOUSE NEAR SERDJILLA, SYRIA, C. 400 A.D.

B. In modern nomenclature, a crown moulding to a cornice of the classic type. It thus specifies a feature and not a profile. The commonest profile is, indeed, that of a cyma recta; but the Tuscan order of Vignola has an ovolo and the Doric a cavetto for the cymatium, and there was no absolute uniformity even in ancient Roman practice. The Vitruvian distinction of Doric and Lesbian cymatium is not clearly understood. Modern architects sometimes substitute a *chéneau* for the regular cymatium above the corona of the crown cornice.

A. D. F. H.

CYPRUS, ARCHITECTURE OF. The ancient architecture, so far as its remains have been studied, takes its origin in a very ancient and entirely non-Greek original. The abundance of wood with which the mountains were formerly covered, the absence of marble or other hard and abundant stone, and the frequency of earthquakes, aided in a retention of earlier traditions of building, and famous ancient shrines have been explored in modern times without the discovery of any indications of permanent architectural structures. On the other hand, there are several buildings of unknown date which are extremely interesting, the most important of these being that known as the tomb of S. Catherine, not far from Salamis, a piece of dry masonry of large stones, the roof itself being composed of stone. A smaller building, also of unknown date, near Larnaka, has the roof formed of a single stone shaped on the under side to a hollow curve, as if in imitation of a vault. At Kouklia, among the ruins of old Paphos, are the foundations of a temple of Aphrodite, and traces of another are to be found at Golgoi. Salamis has been explored by the managers of the Cyprus Exploration Fund during the years beginning 1890; the site of Agora and that of the sacred temenos of Zeus have been found, and many architectural remains; but no Greek structure exists in a condition other than that of complete ruin. The significance of these foundations, subterraneous structures, basement walls, and bases of columns has yet to be fully ascertained. In like manner the Acropolis of Curium, from the neighbourhood of which a vast number of valuable Greek and Oriental objects have been brought, mostly from tombs, has been partly explored, a theatre has been located, and a temple enclosure, with many columns of granite and marble, has been laid bare and mapped. At Dali, the ancient Idalion, another shrine has been pointed out.



Cymatium from a House near Serdjilla, Syria, c. 400 A.D.

From all this it appears that nothing of very great importance to Greek architecture will be learned. Roman remains are also rare, or of little consequence, so far as yet known. There are several very interesting small Byzantine churches, not unlike those of Athens as to their small size and their system of construction, but peculiar in having in some cases octagonal drums upon which rest octagonal cupolas. The Gothic buildings of the crusading epoch are much more important in size and in architectural pretension. The Lusignan dynasty, which was founded under the auspices of Richard I. of England in the twelfth century, lasted, with some interruptions, until the fifteenth century; and whatever the inhabitants of the island were in religion or feeling, the ruling race was Catholic and mainly French in its associations. The result of this is seen especially in the very fine cathedral of Famagusta, dedicated to S. Nicholas; also in the church dedicated to S. Sophia (probably with the same significance as in the great church at Constantinople, that is to say, as the Holy Wisdom, and not to any personal saint), which is a Gothic church in general design and in detail. The interior is peculiarly interesting. The church at Nicosia, a mediæval town without known Greek origin, is also a Gothic church of great beauty, although changes have been made by the Turks in order to fit it for use as a mosque. There are the ruins of an interesting Gothic convent, including a superb cloister, at Bellepais. One of the most puzzling buildings in the island is also at Nicosia. This, although its structure marks it as of the thirteenth century, has much curious sculpture bearing all the marks of French Romanesque of about 1150. All the Gothic buildings in the island deserve attention; especially because of an evident tendency to carry upon the vaults a solid masonry roof of low pitch. It is to be hoped that the present English rule will preserve them without destroying them by unwise restoration. Cyprus is treated at great length in Murray's *Handbook to the Mediterranean*, and the classical and mediæval monuments have been discussed by H. B. Walters in the (London) *Architectural Review*, 1888–1889.

Ohnefalsch-Richter, *Kypros, the Bible and Homer.*

— R. S.

CYRENAICA, ARCHITECTURE OF. (See Barca, Architecture of.)

CYRENE, ARCHITECTURE OF. (See Barca, Architecture of.)

CYRUS; architect; d. 52 B.C.

A Greek architect employed by Cicero. He made Cicero and Clodius joint heirs of his estate. He died on the day when Clodius was murdered.

Brunn, *Geschichte der griechischen Künstler.*

CYZICENE HALL (Œcus Cyzicenus). In ancient domestic architecture, a large hall look ing out upon a garden, it served the purpose of a triclinium or banquet hall, though much larger than the ordinary triclinium. The cyzicene hall was a feature of Greek rather than of Roman houses. (Vitruvius, VI., 6.)

D

DAB (v.). *A.* To dress the face of a stone or of stonework, by picking or fretting with a pointed tool. (Written also, in England, Daub.)

B. Same as Daub.

DADO (n.). *A.* In Italian, a tessera or die; hence the flat face of a pedestal between the base and cap. In English it denotes a continuous pedestal or wainscot, including the base and cap moulding, or sometimes only the plane surface between the base board and cap moulding of such a continuous pedestal. A panelled wooden dado is generally called a Wainscot; the words are often used erroneously as if synonymous. Dado is not usually used of an external pedestal course.

B. A groove formed by dadoing. (See Dado; v.)

DADO (v. t.). To cut or form with a groove or grooves of a rectangular section, as in making the upright sides of a bookcase which are so grooved to receive the ends of shelves; hence, with the preposition *in:*

To insert in such a groove or grooves; to perform the whole operation of connecting parts in such a manner. Thus, it may be said of a bookcase that the shelves are to be *dadoed in.* The term is usually applied only to such a method of connection when the groove is made to receive the full thickness of the inserted piece. (See House, v.)

DAGOBA. In Buddhist architecture, a shrine for relics. (For those set up within a temple and having a position akin to that of the *chasse* or reliquary in Christian ecclesiology, see Chaitya Cave. For the large dagobas of architectural character, see Pagoda; Stupa; Tope.)

DAIRY. A building, or part of one, in which milk and its products are kept, butter and cheese made and packed for market, or stored; usually an unpretending farm building, but occasionally built with elaborate care. Equable temperature — not too high, even in summer, while still perfect ventilation is maintained — and precautions for extreme cleanliness are the essential features. Rooms for the cleaning and drying of the vessels used, and an opportunity for transferring rapidly to the cattle yard those products, such as whey and buttermilk, which are not commonly salable, are matters to be thought of.

In many country places milk is kept sweet by standing the large cans in running or rapidly changing water (see Spring House); or sometimes a running stream is carried through the dairy itself. — R. S.

DAIS. *A.* In a banquet hall, or the like, a table for distinguished persons; a high table, together with the raised platform on which it stands; hence, —

B. Any similar platform, as in a lecture hall to accommodate the speakers and others.

C. In French, a canopy over such a table or platform, or over a throne or similar seat.

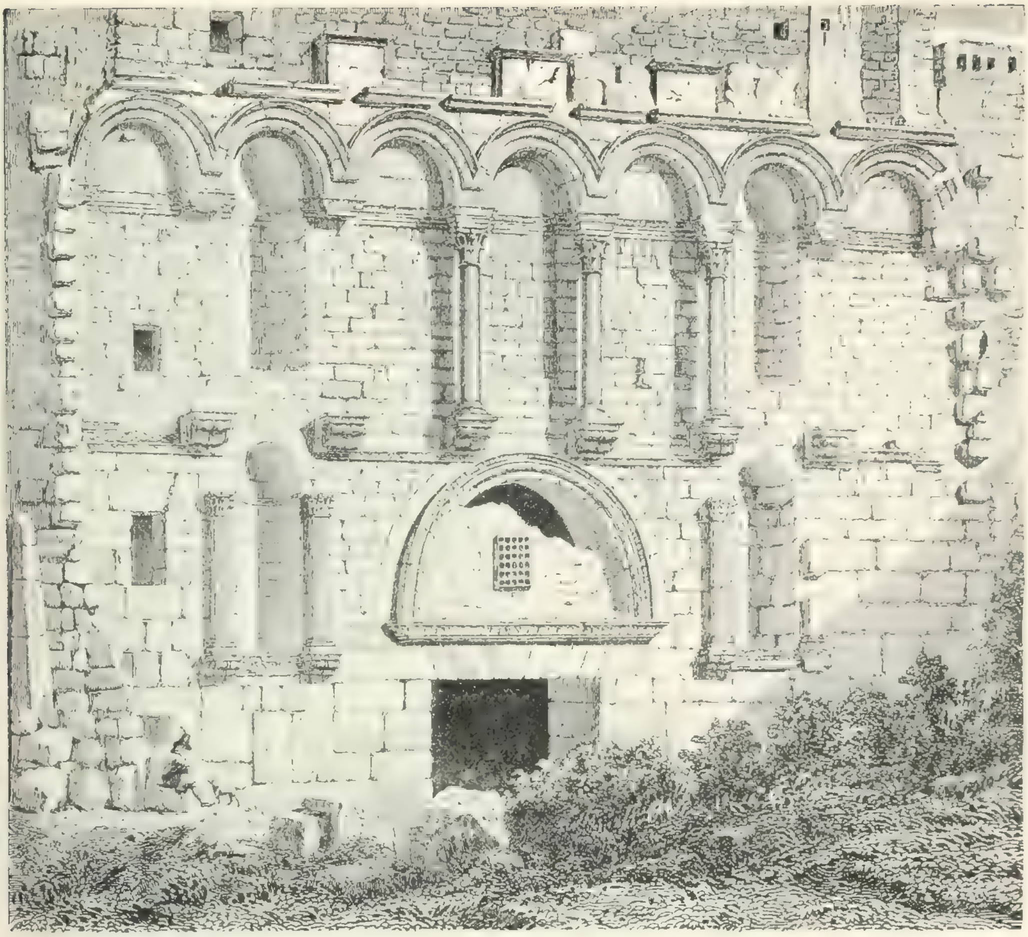
DALAN; **DALLAN.** In Persian and Indian architecture, a veranda, or sometimes a more stately hall of reception, but always more or less open to the weather with a roof carried on columns, or the like.

DALLE. In French, a flat slab, large or small; in English, a slab of some size larger than a tile, as forming a sepulchral monument, or the like.

DALMATA, GIOVANNI. (See Giovanni Dalmata.)

DALMATIA, ARCHITECTURE OF. The architecture of the country which is called in modern times by the above name, and which is a crown land of the Austrian sovereigns. It represents the seacoast of the Roman provinces of Illyricum from Scutari (now Scodra) on the south to Zara on the north, and, in addition to this, the islands in the Gulf of Quarnero. Its chief town in antiquity was Salona, which was an important seaport and a central station of the imperial fleet. Nothing is known of the ancient buildings of this town, which are stated to have been important, especially after the time of Diocletian, who greatly improved the town, as no archæological investigation has taken place. The same emperor built, in the immediate vicinity, that extraordinary villa which, under the name of the Palace of Diocletian, has given name to the modern Spalato (from Palatium, a palace), a little town built chiefly within the walls of the ancient imperial residence.

Salona itself is traceable only by the ancient walls, the amphitheatre, of which there are considerable remains, and the substructures of the theatre. There are the remains of a Christian basilica of very unusual plan, but this was destroyed, finally, in the seventh century, so that only excavation has revealed the general character. Immediately to the south of the city is the great square palace of Diocletian, and this is so far complete that its architectural character is well understood. It has immense interest for the student of classical architecture, because of its style; with arches very commonly springing from the capitals of columns, although in some cases a horizontal trabeated structure, reminding one of a truly classical entablature, is interposed between the capital and the archivolt above. There is here also a most singular rotunda, the temple of Jupiter, which was covered by a



Dalmatia: Diocletian's Palace at Spalato, the Porta Aurea or Gilded Gateway.

cupola of interesting masonry, and a temple of Æsculapius, of a more common type; but each of these buildings is more nearly classical in its architectural adornment.

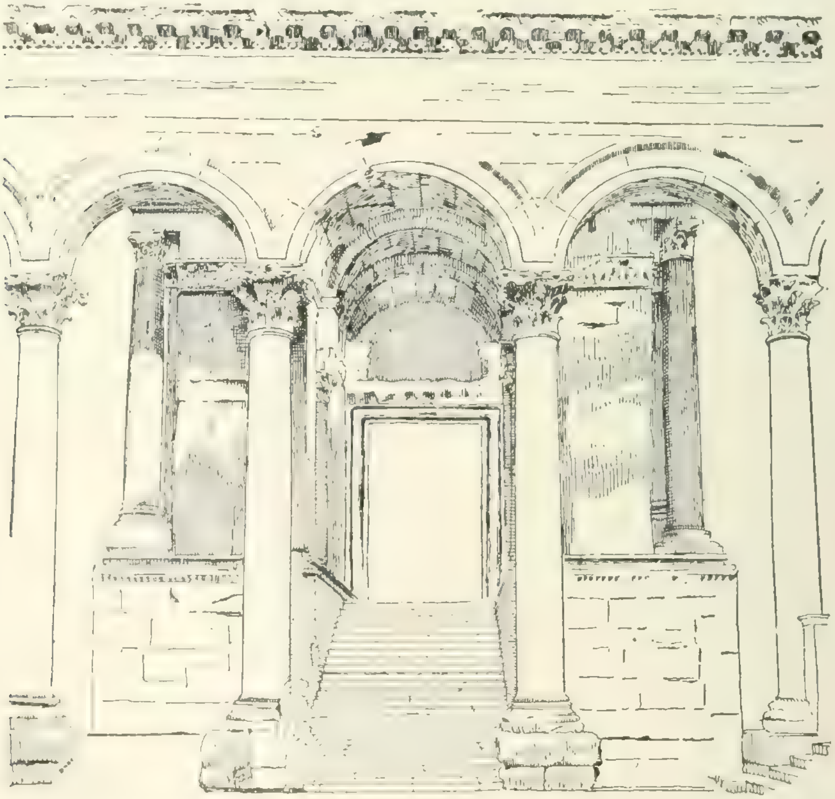
Narona, a very ancient city which received a Roman colony, and was of importance, has furnished many Roman inscriptions, but nothing of its architecture is known. In general, Roman remains are but few or have been but little studied, with the single exception of those at Salona.

The more recent architecture of Dalmatia is chiefly interesting from the Venetian influence, which was vastly stronger than that of the Eastern Empire in the earlier days, and was supreme at a later time. The buildings at Cattaro and Ragusa, in the far south, and those of Sebenico and Zara farther north, are of very great interest. The cathedral of Sebenico is a remarkable building, roofed with stone in an unusual way, and, apart from this, of great merit. At Ragusa, the municipal palace is the important building: Venetian Gothic of the fifteenth century with later insertions, as of a very interesting round arched arcade. At Trau there is a cathedral with admirable Lombard Romanesque portal, and a triapsal east end of great interest; also a bell tower in which Eastern feeling has modified the Italian Gothic design in a very interesting fashion. At Cattaro there is a cathedral in which many of the details are of extreme interest, Italian Romanesque passing into Gothic, and with a curious west front composed of two square towers with a huge archway of entrance between them; a design reminding one of the Tyrol rather than of any part of Italy. At Zara there are many buildings of interest: the Romanesque cathedral; the round church of S. Donato, an important building of the type, and worthy of comparison with the church of S. Vitale at Ravenna; a baptistery studied evidently from the round temple at the palace at Spalato; also the early Romanesque church of S. Lorenzo; also S. Grisogono and S. Maria; and details, interior and exterior, and church furniture of extreme interest. In this town, too, there are domestic buildings of Venetian Gothic, at least in part, which are as attractive as many of those in Venice itself. (Cut, cols. 745, 746.)

For the northern part of the Adriatic seacoast see Istria, Architecture of.

T. G. Jackson, *Dalmatia, The Quarnero and Istria*, Oxford, 1887, a valuable book containing much personal observation; Robert Adam, *Ruins of the Palace of the Emperor Diocletian*, etc., folio, 1764, a book worthy to be classed with Stuart and Revett's works.

— R. S.



Dalmatia: Palace of Diocletian at Spalato, Arcade of Great Court and Entrance.

DALY, CÉSAR; architect; b. 1811 (at Verdun, Meuse, France); d. Jan. 11, 1894 (at Wissous, near Paris).

Daly's early education was obtained at the *École Polytechnique* at Douai, France. He afterwards entered the *École des Beaux Arts*, Paris, and the atelier of Jacques Félix Duban (see Duban). With the encouragement of Duban and Labrouste (see Labrouste) he founded in 1839 the *Revue générale de l'Architecture* and continued the publication of that journal until 1890. His actual professional practice was mainly confined to the restoration of the cathedral of Alby (Tarn, France), of which he was appointed architect in 1843. The *Semaine des Constructeurs* was established in 1876 by César and his son Marcel. He spent three years in the United States, Mexico, and Central America, and in 1856 was the first to note several important pre-Columbian ruins. In 1869 he visited Palestine. Next to the *Revue*, Daly's most important publications were the *Motifs historiques d'architecture et de sculpture d'ornement*, 2 series in 4 vols. folio, 1870–1880; *L'Architecture privée au XIX^e siècle*, 2 v. in 3 folio, 1870, 1872, 1877; *Motifs divers de serrurerie*, 2 v. in 1 folio, Paris, 1881–1882. In his eightieth year he planned and made preparations on a large scale for a new dictionary of architecture.

H. H. Statham in the *Builder* for Jan. 20, 1894; Obituary in *Architecture and Building* for Jan. 20, 1894; Charles Lucas in *La Grande Encyclopédie*.

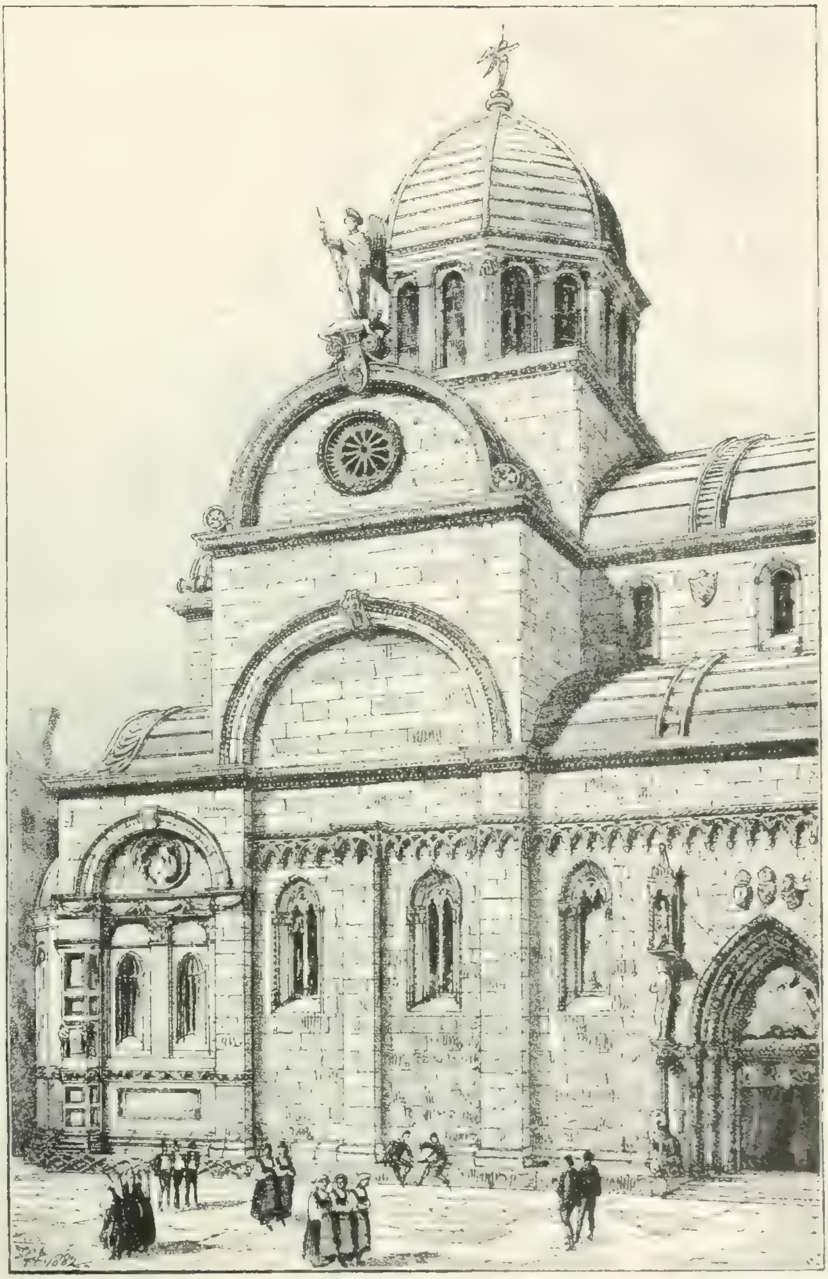
DAM, NIELS; architect; b. Oct. 15, 1761 (at Copenhagen).

He won, at the Academy of Copenhagen, the silver medal in 1784, the larger gold medal in 1791, and, in 1804, the travelling stipend. In 1818 he published *Noget om den borgerliche Bygningskunst for Bygmestre*.

Weilbach, *Nyt Danske Kunstner Lexicon*.

DAMAS, JEAN DE. (See Jean de Soissons.)

DAMMARTIN (DAMPMARTIN), ANDRÉ DE; architect; d. about 1400.



DALMATIA: THE DUOMO AT SEBENICO, REMARKABLE FOR STONE ROOF.

Andre was employed at the Old Louvre in the year 1365. January 28, 1380, he was called to Troyes (Aube, France) to inspect the works at the cathedral. In 1383, by letters patent of Philippe le Hardi, Duke of Burgundy (b. 1342; d. 1404), he was appointed chief architect of all his constructions and especially of the church and monastery of the Chartreuse near Dijon (see Sluter, Claux). In 1384, with Raymond du Temple (see Raymond du Temple), he inspected the works at the château of Rouvres (France).

Assier, *Comptes de la fabrique de l'église de Troyes*; Berty, *Topographie*, *Louvre et Tuileries*; Gonse, *L'Art gothique*; Chabeuf, *Dijon, Monuments et Souvenirs*.

DAMMARTIN, GUI (GUIOT) DE; architect; d. about 1400.

Gui de Dammartin was one of the best pupils of Raymond du Temple (see Raymond du Temple, and was employed on the Old Louvre. He was the preferred architect and sculptor of Jean de France, Duke of Berry. Between 1384 and 1387 he rebuilt the great hall of the palace at Poitiers (Vienne, France) which had been burned by the English in 1345.

Gonse, *L'Art Gothique*; Robuchon, *Paysages et Monuments du Poitou*, Vol. I, *Poitiers*.

DAMMARTIN, JEAN DE; architect; d. about 1454.

January 24, 1421, Jean was made *maître de l'œuvre* (supervising architect) of the cathedral of Le Mans (Sarthe, France). He built the northern arm of the transept with its rose window. In 1432 he became architect of the cathedral of Tours, where he completed the nave and began the main portal.

Grandmaison, *Tours archéologique*; Bauchal, *Dictionnaire*.

DAMON, CAPTAIN ISAAC; architect.

Damon studied architecture with Ithiel Town (see Town, I.) of New York, and was from 1812 to 1840 the leading architect in western Massachusetts. Among his works were the first church of Northampton (built 1811, burned in 1878), the first church of Springfield (about 1818, still standing), the church and county courthouse in Lenox (about 1814, still standing).

G. C. Gardner in *Am. Architect*, Vol. XLVII., p. 40.

DAMP COURSE. A course or layer of impervious material in a wall or floor to prevent the ingress of moisture from the ground or lower courses. It extends entirely through the wall, and perhaps upward on the outer face or in the thickness of the wall. It may be of lead, asphalt, or of compact and non-porous stone.

DAMPER. A valve or diaphragm to check or control the draft in a flue or duct. In open fireplace flues, the damper is often a cast-iron or soapstone flap, in the throat, lying back, when open, upon a ledge at the back above the throat, and tilted forward when it is desired to close the throat against down draughts. In smoke pipes and furnace flues it is commonly a metal diaphragm pivoted transversely.

DAMPMARTIN. (See Dammartin.)

DANCE, GEORGE (I.); architect; b. 1695; d. Jan. 11, 1768.

December, 1735, Dance was appointed "clerk of the city works" by the corporation of the city of London. Between 1739 and 1753 he designed and built the Mansion House (the official residence of the lord mayor of the city of London), which was altered somewhat by his son George Dance. (See Dance, George, II.) He built many London churches.

Arch. Pub. Soc. Dictionary; Britton and Pugin, *Public Buildings of London*.

DANCE, GEORGE (II.), **R. A.**; architect, b. March 20, 1741; d. Jan. 14, 1825.

A son of George Dance (I.), (see Dance, George, I.). He went to Italy and in 1763 won a gold medal at the Academy of Fine Arts at Parma. In 1764 he was admitted to the Academy of S. Luke at Rome. Returning to England he succeeded his father as clerk of the city works in 1767. Between 1770 and 1778 Dance erected the famous Newgate Prison (London).

Redgrave, *Dictionary of Artists*; Britton and Pugin, *Public Buildings of London*; *Arch. Pub. Soc. Dictionary*.

DANCETTE (adj. and n.). *A.* In heraldry, having the edge cut into a zigzag; said of a fess or similar bearing; said also of a single line which acts as a boundary line. By extension (noun) a zigzag band or bar, or a row of lozenges or similar figures joined by their corners.

B. In architecture, a zigzag used for ornamental purposes, as in the Romanesque style of England or Normandy. (Compare Batons Rompus; Zigzag.)

DANCKERTS DE RIJ, CORNELIS (the elder); architect; d. about 1595.

This Danckerts, father of the more famous Cornelis Danckerts the younger, was city architect of Amsterdam.

Kramm, *Hollandsche en Vlaamsche Kunstschilders*, etc.

DANCKERTS DE RIJ, CORNELIS (the younger); architect; b. 1561; d. 1634.

A son of Cornelis Danckerts de Rij the elder. In 1595 he succeeded his father as city architect of Amsterdam (Holland). According to Immerzeel, he built the Haarlemmer poort, the Zuiderkerk, and the Noorderkerke in Amsterdam. He also built the fine tower of the Westerkerke.

Kramm, *Hollandsche en Vlaamsche Kunstschilders*; Immerzeel, *Hollandsche en Vlaamsche Kunstenaars*.

DANESE. (See Cattaneo.)

DANIELLO DA VOLTERRA. (See Ricciarelli, Daniello.)

DANISH ARCHITECTURE. (See Denmark, Architecture of.)

DAPHNIS; architect.

Daphnis was one of the architects of the temple of Apollo near Miletus. (See Theodorus.)

Brunn, *Geschichte der Griechischen Künstler*.

DAR. *A.* In Indian and Persian architecture, a gateway. The term enters into many compounds, as buildings are named from the gateways which they cover or protect, and gateways themselves take names from the roads passing through them, the cities to which these roads lead, and the like.

B. Also, in Oriental architecture, a place of abode, a dwelling house, and by extension a city in the same connection ; as the German word *Residenz-Stadt*. This term also enters into many compounds, and, in alliteration in European languages, one set of compounds cannot always be distinguished from another.

DART. The pointed member which alternates with the egg-shaped detail in the ornament known as Egg and Dart, or Egg and Anchor.

DA SILVA. (See Silva.)

DATUM LINE ; POINT. In surveying, platting, or designing, the base line or starting point at which the work of measuring or laying out begins, and from which distances, heights, or angles may be reckoned.

DAUB (n.). The material used to daub ; the covering as applied by daubing ; a rough coat of mortar thrown on a wall to give it a rough, uneven appearance, sometimes to resemble rough stones ; rough cast. (Also called Daubing.)

DAUB (v.). To cover or smear roughly, as in building, with coarse plaster or clay ; especially when done without any attempt to produce a uniform and regular coat ; as in covering wattle work or filling the chinks of a log construction. (See Chinking ; Log House ; Wattle and Daub ; Wattling.)

DAVID, CHARLES ; architect ; b. 1552 ; d. Dec. 4, 1650.

In 1582 David married the daughter of Nicolas Lemercier. (See Lemercier, Nicolas.) In 1585 he succeeded his father-in-law as architect of the church of S. Eustache (Paris), and continued that work in the peculiar and interesting style established by his predecessors. He built the choir (1637) and the old portal which was reconstructed in 1753 by Jean Hardouin-Mansart de Jouy. (See Hardouin-Mansart de Jouy.)

Palustre, *Renaissance en France* ; Calliat and Le Roux de Lincy, *Église Saint-Eustache à Paris*.

DAVID D'ANGERS, PIERRE JEAN ; sculptor ; b. 1788 (at Angers, Maine-et-Loire, France) ; d. Jan. 5, 1856.

David's father, Pierre Louis, was a wood carver who took an active part in the wars of the French Revolution. Pierre Jean was taught to model in his infancy, and at the age of twenty went to Paris. He was at first employed on the decoration of the Arc de Triomphe du Carrousel, which was completed in 1809. (See Percier and Fontaine.) He entered the atelier of Roland at the *École des Beaux Arts*, and in 1811 won the *Premier Grand Prix de Rome*. In 1816 he was commissioned to complete the statue of Condé, now at Versailles, for which Roland had made a sketch. This work begins his long series of public statues and monuments, of which the most important are : the monument of Bonchamp (1824), that of Fénelon (1825), that of General Foy at Père Lachaise (1827), that of Racine (1855), that of Gutenberg at Strassburg (unveiled June 24, 1840), and that of René d'Anjou, inaugurated at Angers (France) Jan. 2, 1853. David's favourite work was the charming statue of a girl called *La jeune Greque*, which he made for the monument to Marco Bozzaris at Missolonghi (Greece) (1827). Between 1828 and 1835 he made the sculpture of the triumphal arch called *Porte d'Aix* at Marseilles, and between 1830 and 1837, the sculpture of the pediment of the Panthéon (Paris). The most characteristic of David's performances is the splendid series of medallion portraits of celebrated contemporaries which he began about 1827.

Jouin, *David d'Angers* ; Brownell, *French Art* ; Blanc, *Les artistes de mon temps*.

DAVIOUD, GABRIEL JEAN ANTOINE ; architect ; b. Oct. 30, 1824 (at Paris) ; d. April 6, 1881.

He was a pupil of Léon Vaudoyer (see Vaudoyer). In 1855 he was made architect of the plantations and promenades of Paris. About 1862 Davioud built the *Théâtre Lyrique* and the *Théâtre du Châtelet* (Paris). In association with Bourdais, he designed and built the palace of the *Trocadéro* for the exposition of 1878.

Destors, *Notice Nécrologique* in *Revue générale de l'Architecture*, Vol. 38 (1881), p. 125.

DAX, PAUL ; painter, glass painter, and architect ; b. 1503 ; d. 1561.

He painted the glass of the palace and of the palace church at Innsbruck in the Tyrol in 1540, and was later commissioned to paint eighteen windows for the *Rathaus* at Ensisheim in Alsace. He surveyed the boundary between Bavaria and the Tyrol, and made a relief map of northern Tyrol.

Seubert, *Allgemeines Künstler-Lexicon*.

DAY. Same as Light, in the sense of one division of a window, as, in a large church window, the space between two adjoining mullions.

DAYLIGHT. An open space ; a clear interval, as between the jambs of a window. Thus a window measuring 3 feet between the outer masonry jambs is said to be 3 feet wide, mason's daylight. (Compare Jour.)

DAY'S WORK. *A*. Work executed at a given rate per day, as distinguished from that paid for by the piece or contracted for at a given total figure. Day's work is especially advantageous where quality is of greater importance than time or cost in money.

B. The amount of work performed by, or to be required of, a mechanic in one day within the limit of hours allowed by law or custom in his trade. (See Contract.)

DEAD (adj.). *A*. Flat, dull, without brilliancy, as varnish which has been rubbed so that it has little or no gloss; flat, as a coat of paint.

B. Without variety; without important features, as a blank wall.

C. Without spring or elasticity; impervious to sound, as a floor which has been made non-conducting.

D. Without motion; quiescent, as a more or less stationary load as distinguished from the load due to persons or movable furniture. (See Dead Load.)

E. Without action; without independent power of motion, as a dead bolt.

F. Useless; no longer serving the original purpose, as a flue which has been closed up. (See Deafen; Flat; Flatting.)

DEAD COLOUR. Colour having no gloss or lustre. In painter's work this effect is produced by diminishing the amount of linseed oil in proportion to the turpentine used in mixing the paint. (See Flat; Flatting.)

DEADEN (v.). To make dead; to construct so as to be dead, in the sense of Dead, *A* or *C*.

DEADENING (n.). *A.* The process of making dead.

B. Material used to deaden.

DEAD HOUSE (I.). A house or room for the temporary accommodation of dead bodies; especially one provided for the public exhibition of unrecognized corpses with a view to their identification. It is thus distinguished from the Charnel House, in which, in former times, bodies were kept until the flesh had dried up or decayed; and the Bone House, or Ossuary, to which the bones were finally removed from the charnel house.

DEAD HOUSE (II.). Among the Natchez tribe of American Indians, an oval structure, with a circumference of about 100 feet, with no window, and a low narrow doorway, where the bones of the dead were placed together with certain fetiches, and a perpetual fire was kept burning. (See Ghost Lodge, under Lodge.) The Tlingit of the Northwest Coast build small houses to contain boxes holding the ashes or the remains of the dead. These houses are of logs or slabs, a few feet square, and are sometimes surmounted by carved figures of the totem of the deceased. — F. S. D.

DEAD LOAD. A more or less permanent and stationary load, as distinguished from the load of persons, movable furniture, and the like. Especially the load caused by the weight of a structure as distinguished from the load which it may be intended to support. Thus, in designing a truss or calculating the size of timbers to carry a floor, the weight of the flooring, ceiling, and other portions of the structure are considered as dead load. (Compare Live Load, under Load.)

DEAD SHORE. A vertical shoring timber left in a wall after the completion of the repairs or underpinning on account of which it was introduced; the masonry or brickwork being built up to it on either side, or even around it on all sides.

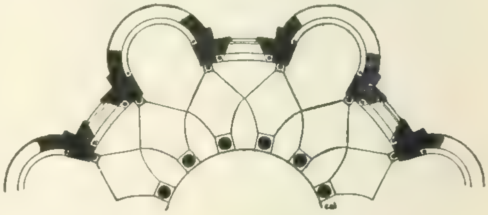
DEAFEN (v.). Properly, to render or to construct so as to be impervious to sound, as by the introduction of felt or other non-conducting material between the two thicknesses of a double floor, or by plaster filling between beams or studs. In this sense, same as Deaden. By extension, to fill in or construct in a manner similar to the operations described above, whether primarily for the purpose of preventing the passage of sound or not; as in making a floor fireproof by filling the spaces between the beams with non-combustible materials.

DEAFENING (n.). Materials used, or intended to be used, to deafen with; the process of applying such materials.

DEAL. In English usage, a piece of pine or fir lumber cut to the dimensions commonly required in joiner work and the lighter branches of carpentry; and hence, without the article, such lumber collectively. The standard deals average 12 feet by 3 by 9 inches; these are sawed into whole deals of 1¼ inches thick; slit deals of ⅝ of an inch thickness (three cuts), and five-cut stuff when the thickness is ½ inch or less. Pieces less than 7 inches wide are called battens; if less than 6 feet long deal ends. This whole system of cutting and naming sawed lumber is unknown in the United States. (See Lumber.) — A. D. F. H.

DEAMBULACRUM. In Roman architecture, a walk or passage, usually covered. (Compare Deambulatory, which is the same word applied to Christian churches.) (Written also Deambulatio; Deambulatorium.)

DEAMBULATORY. A covered passage or walk, as the ambulatory of a cloister; specifically, an aisle extending around the apse of a church. An apse aisle. (Cuts, cols. 753, 754; 755, 756.)



DEAMBULATORY OF NOTRE DAME DU PORT AT CLERMONT-FERRAND (PUY-DE-DÔME), FRANCE.

DEANE, SIR THOMAS; architect; b. 1792; d. Sept. 2, 1871.

Deane was the son of a builder of Cork (Ireland). He made a fortune in his father's business, became mayor of Cork, and was knighted in 1830. He then commenced practice as an architect and built at Cork the Bank of Ireland, the Savings Bank, the Queen's College, the portico of the Courthouse, etc. With his son Thomas Deane he built the Museum at Oxford (England).

Redgrave, *Dictionary of Artists.*

DEANERY. The official residence of the dean of an Anglican collegiate or cathedral church.

DEAN'S SEAT. The throne or fixed seat provided for the dean when acting as president of the chapter, as of a cathedral. Occasionally in a chapter house this feature is treated with great elaboration, as in the cathedral church of S. Mungo in Glasgow.

DEARN. Same as Durn. — (C. D.)

DEATH HUT. (See Dead House, II.)

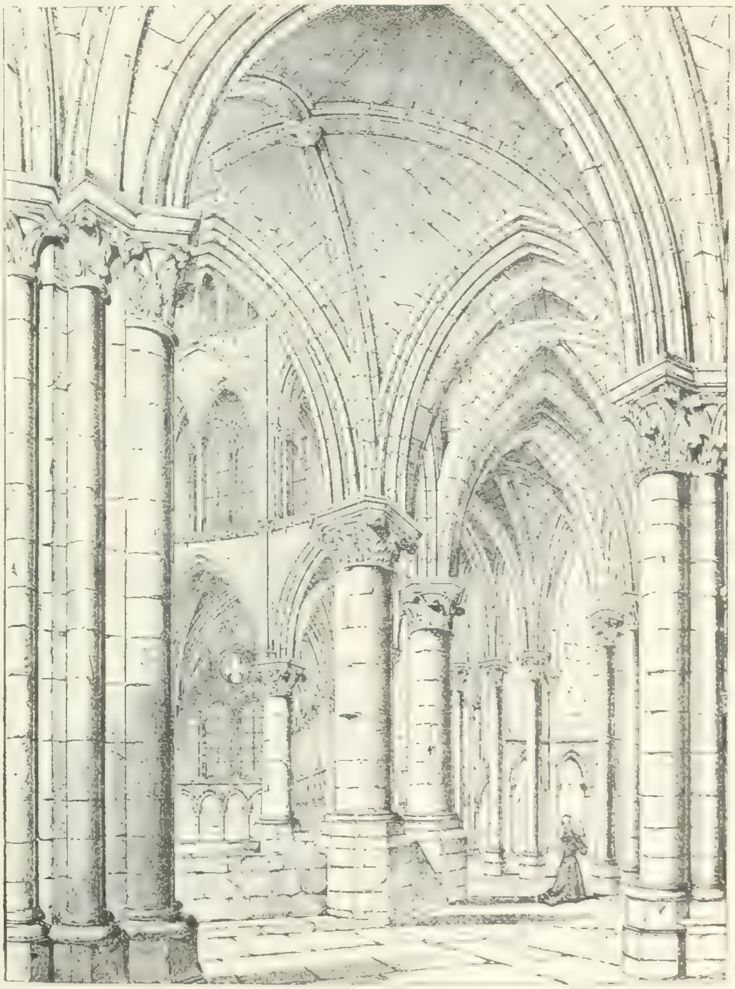
DEBRET, FRANÇOIS; architect; b. June 27, 1777; d. Feb. 19, 1850.

Debret was a pupil of Charles Percier (see Percier). In 1813 he replaced Cellerier as architect of the abbey church of S. Denis, where he accomplished numerous restorations. He was himself replaced by Viollet-le-Duc in 1846. After 1822 Debret laid the foundations of the building of the *École des Beaux Arts* (Paris), which was continued by his pupil, Jacques Félix Duban (see Duban).

Lance, *Dictionnaire*; Bauchal, *Dictionnaire*.

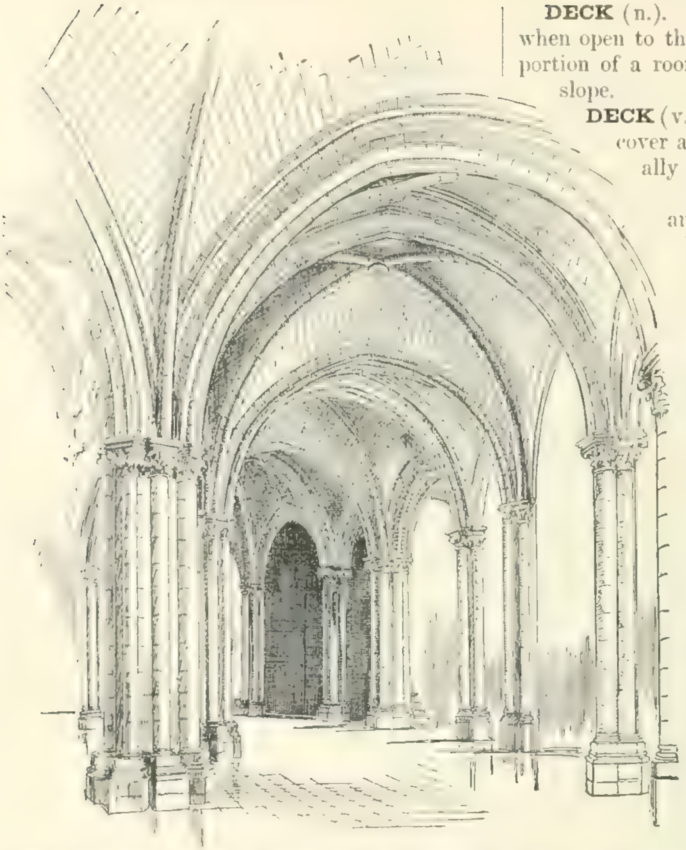
DE BROSSE. (See Brosse.)

DECADENCE. Decline in purity, simplicity, or significance, as in sculptural or architectural decoration, or in the application of architectural design to building. A state of decadence does not exclude attractive and interesting work of many kinds; and there may be a marked decadence in some branches of art while others still flourish. Thus, in the fourth century A.D., the great basilica begun by Maxentius and finished by Constantine about 315, and still existing in part on the northeastern side of the Roman forum, is a building of great magnificence and extent, and of remarkable boldness of execution, although contemporary with a decline in sculpture so complete that it is one of the unsolved problems of artistic history. So a century later, and still more in the sixth century, sculpture, having almost disappeared from the Roman world except in the carving of conventional leafage, was in a sense superseded by mosaic, which art reached at this time a previously unknown pitch of decorative magnificence. (For the decadence of art in the eighteenth century, see Barocco; France, Architecture of; Germany, Architecture of; Italy, Architecture of.) — R. S.



Deambulatory: Notre Dame de Châlons (Marne), France, 13th Century.

DECADENT. In a state of decline or deterioration in style or excellence. The term is used to characterize the closing period of the history of a style in architecture which is marked by a noticeable falling off in purity, good taste, and refinement of detail; as, for instance, the Roman architecture of the fourth century A.D. (See Decadence; Roman Imperial Architecture.)



Deambulatory of the Cathedral of Toledo, Spain: the Outer One of the Two Aisles of the Apse, 14th Century.

DECADENZA. In Italian, the decadence. The term is applied specifically to the decline of the Classicismo, or formally classical style of the seventeenth century.

DECASTYLE. Having ten columns in the front or end row, consisting of a row or rows of ten columns; said of certain classic temples, of which the chief example was the great temple of Artemis at Ephesus. The temple of Zeus Olympius at Athens, formerly supposed to have been decastyle, has been proved to have been octastyle. The temple of Venus and Rome, built by Hadrian in Rome about 130 A.D., was decastyle, the only known example in Roman architecture. (See Columnar Architecture.)

DECHAUME or **DE CULMIS, NICOLAS**; architect.

In 1316 Dechaume made a visit of inspection to the cathedral of Chartres with Pierre de Chelles (see Chelles, P. de) and Jacques Lonjumeau of Paris. In 1319 he was made supervising architect (*maître de l'œuvre*) of the cathedral of Sens, and retained that office until 1339. He is supposed to have built, at that cathedral, the central stone tower, the chapels of the deambulatory, and most of those of the nave.

Bauchal, *Dictionnaire*.

DECK (n.). A floor, or platform, especially when open to the weather, as a flat uppermost portion of a roof which is elsewhere of a steep slope.

DECK (v.). To provide with a deck; to cover as with a floor or deck. Generally with *over*.

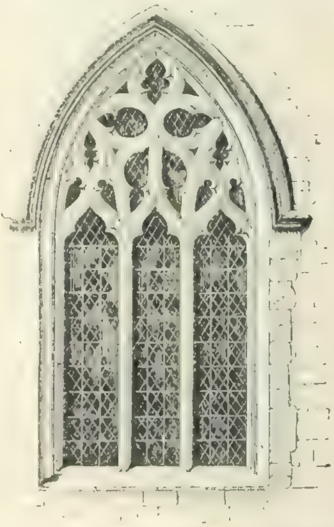
DECKER, PAUL; architect and engraver; b. 1677 (at Nürnberg, Germany); d. 1713.

In 1699 Decker went to Berlin and was associated with Andreas Schluter (see Schluter, A.). In 1707 he was appointed court architect at Bayreuth (Bavaria). His *Fürstlicher Baumeister* was published after his death. It has been recently republished with an introduction by R. Dohme (Berlin, 1885, 1 vol. folio).

R. Dohme, *Einleitung* to his edition of the *Fürstlicher Baumeister*; Seubert, *Künstlerlexicon*.

DECORATE (v.). To make beautiful or interesting to the eye, whether by the proper arrangement, shaping, and colouring of the essential part or by the addition of ornament, or in both ways. (See Decorative Art.)

DECORATED ARCHITECTURE; DECORATED STYLE. The Gothic architecture of England of the style which followed next after the early English, so styled by Thomas Rick-



Decorated the English Decorated Style; Window of S. Peter's-in-the-East, Oxford.

man (see Rickman). The epoch covered by the Decorated style may be considered as prevailing from 1280 to 1380, or for very nearly the years covered by the reigns of the three Edwards. (See England, Architecture of; Scotland, Architecture of.)

DECORATION. *A.* The act or art of making beautiful or attractive.

B. The result of a deliberate attempt to beautify or adorn. In this sense, used more especially for the sculpture, painting, inlay, or similar added ornamentation. (See Decorative Art.)

See bibliography under Keramics; Mural Painting; Polychromy; Sculpture. The decorative work of modern highly trained artists can best be studied in the work of a single artist and his assistant. Havard's *L'Œuvre de P. V. Galland* tells of one who worked in painting, tapestry, and many applications of art. In this, as in most kindred subjects, the most valuable writing is to be found in the columns of periodicals.

— R. S.

DECORATIVE ART. The art by which that which would otherwise be merely useful is rendered delightful to the eye or interesting to the mind, by the use of form and colour, arrangement of parts, and frequently expressional or descriptive painting or sculpture.

The terms "decoration" and "decorate," in their logical senses, all point toward fitness and toward a proper and seemly arrangement either of the essential parts or of the added ornaments, or both, as partly seen in the signification of decorous, decorum; they have also in different degrees lost their original meaning, and tend to imply rather the bringing in of extraneous or inessential parts to produce an ornamental effect. Thus, the verb *to decorate* has grown to imply the addition to the essential structure of sculpture, or inlay, or painting, or some such artistic means which are not called for by the primal requirements of the building itself. The adjective *decorative* has a somewhat less decided meaning; thus, the phrase "decorative treatment" may be used to imply the laying out, the composing, the massing of the essential parts of a building as well as the addition of sculpture or colour.

Architecture is a decorative art because it has to do with making that beautiful, suggestive, or attractive which might exist and do its necessary work perfectly well without the possession of any æsthetic charm. The planning and architectural treatment of a building is not unlike the arranging and decorative treatment of a sword hilt, as of a sixteenth century rapier, or other weapon intended at once for hard service and for beauty of design; the essential character of each part must of necessity be retained, and yet each part is so modified that it reaches a singular degree of elegance, suggestiveness, and even abstract beauty; while finally, delicate chasing, and even the addition of floral or animal forms, or even of human forms, in cast and highly finished metal, corresponds, in the sword hilt, to the application of similar ornaments to a building. In the fourth and fifth decades of the present century, decorative art in this large sense had almost disappeared; and there has been, since 1850, but a slow and too self-conscious effort at recovery of the old unsought ease of design. The adornments which we apply — alike to our buildings and to the few groups, vases, pieces of furniture — are the work of the draughtsman or modeller who produces something which he thinks fine in itself, and then applies it, haphazard, to a utensil or a building, rather than the work of a true decorative artist. Traditions of decorative treatment which passed from Egypt and from Mesopotamia into Greece and Italy, and which, strengthened by Hellenic influence, were perpetuated by the Roman domination so strongly that they survived the chaos of the earlier Middle Ages, being aided therein by the continued existence of the empire centred at Constantinople, — those traditions, which are traceable in no uncertain way through the Gothic epoch, through the epoch of the Renaissance in Italy, and through the succeeding styles of the sixteenth, seventeenth, and eighteenth centuries, seem finally to have perished soon after the close of the Napoleonic wars. From that time on the tendencies which had been seen at an earlier day became dominant, and persons charged with architectural or other decorative designing became self-conscious and overmastered by theory; they went afield to study this style or that in the work of the past, and deliberately undertook the task of making designs in Egyptian, in Persian, in Grecian, or in Chinese taste. Similar attempts had been made in other ages. Under the Emperor Hadrian, people tried to be Greek in the style of the earlier epoch; under Louis XV., the French and Dutch artists tried to be Chinese, imitating, as they thought, the beautiful silks, paintings, and carvings which were brought from the far East; under Charles II. and his successors, English builders tried to be Gothic, and Sir Christopher Wren designed the western towers of Westminster Abbey. All these, and many other, fancies there have been, each of which would have seemed the evidence of feeble and failing artistic sense; but the traditions still had life, and therefore decorative art lived on. In our own time, traditions, if not absolutely dead, are preserved only by some few artists of very singular insight and of critical instinct; and, at the same time, the fancy for studying different styles has become immeasurably stronger than in any past age because of the facilities which travel, the rapid development of scientific archæology, and the photograph give to the collector and the copyist.

During the decade 1889–1899 there has been a marked tendency in France and Germany to develop a decorative art of which it may be thought the primary characteristics are that it makes the greatest possible use of the human figure, generally nude, while it ignores almost altogether the natural forms of plants. This is probably because the art of conventionalizing flowers and foliated ornament has perished, and the realistic treatment so common from the middle of the century to the beginning of the last decade had become offensive to all persons of refined taste. The Japanese and Chinese way of drawing flowers and plants is felt to be out of reach of the European designer; in like manner, the mediæval way, whether of the thirteenth or of the fifteenth century, is felt to be impossible to him; and there has not been time to devise a new system of drawing such forms. Perhaps the eagerness above noted to use the human figure has kept the artist from caring to study plant form; as, indeed, was the case among the Greeks of the greatest epoch. It is some confirmation of these theories that animal forms lower than those of humanity are rarely used; and then in a very abstract way indeed, as mere concomitants to the human subject. Resort is had to unmeaning scroll patterns, waves, ripples, zigzags, and flamelike and cloudlike forms, in all cases where the human form cannot be applied.

It is evident that such a system of decorative art requires an extremely delicate and refined taste to keep it from becoming somewhat ridiculous. On the other hand, it is evident that much of this kind of good taste is to be found diffused among a very large class of artists. Men are much more apt to have good taste than they are to have ideas. This is seen in the tendency to adorn exteriors and interiors of buildings alike by means of surface texture. This is sought in modulations of colour, such as are to be found in natural stones, and in bricks and terra cotta exposed to different degrees of heat or modelled to different surfaces; and, for interiors, in the use of textiles, costly or finely woven, and of one tint or of several kindred tints. A drawing-room in a really magnificent dwelling will have its walls covered with a coarse white cotton fabric upon which needlework in very pale yellow has been applied, the pattern of this needlework being quite indifferent because the separate lines of yellow silk can hardly be detected by the eye. Evidently what is needed for success in these simple ways of adornment is, primarily, good taste; and this good taste exists in great abundance and can almost be trusted to produce a not disagreeable result so long as no attempt is made at greater boldness of design.

It appears, however, that the untrained designer can do nothing whatever in the way of contrasting colour; and nothing in the way of such flower-and-leaf design as abounds in the work of all Oriental nations. The humblest Chinese painter of porcelain, or worker in enamel, can handle a palette which includes dark and light blue, dark and light green, vivid yellow and deep red, with gold as the universal harmonizer; and he can design conventional flower forms which he will invest with these contrasting colours in a fashion which no European artist can approach. "The untrained designer" — those words are used deliberately, because the one art of original force which the European world is capable of is that of highly organized sculpture or fully developed painting, such as is taught in the schools and practised only by the recognized master whom we call "sculptor" or "painter"; while the trained workman, full of tradition and gained knowledge, and well prepared for decorative work, though still to be found in France and Italy, is hardly to be reckoned on and is passing away.

The position of the architect is very singular; for, while many architects think much of the decorative part of their business, they have but little inducement to devote much labour or care to it. The principal is much too occupied to design; the pay required by the specially skilled designer would be high, and the man himself might be found capable of little else; there is but little demand from the client, who, generally, takes the scrolls and the friezes which the architect's draughtsmen copy unchanged from old work as being entirely satisfactory. The architect, therefore, even of the best intentions and the most serious good will, finds the task of applying true decorative art to his work on the whole beyond his strength or outside of his opportunities. The greatly changed and still rapidly changing conditions of building are also very much against any such attempt, as is shown by the hopeless way in which old architectural forms are applied as mere surface ornaments to buildings which are constructed in a wholly novel manner and which assume wholly novel proportions.

It seems clear, then, that the best hope for the future is to follow the line of least resistance and to encourage the painter and the sculptor to turn their attention to decorative work. There is, of course, no real distinction to be made between decorative art and art which is not called by that name; the artist will instinctively, and without the need of a definition to guide him, design his painting for a flat wall and his painting for the curved surface of a vaulted ceiling in two different ways, and they will be more or less unlike the same artist's composition for an easel picture according to the circumstances and according to the nature of the man. That the painters and sculptors of first-rate ability have begun, during the past quarter century, to consider more gravely than before the necessities of the situation and to prepare their work for its readiest and most fitting adaptation to buildings and other objects of utility, is the best sign for the future of decorative art. — R. S.

DE COTTE. (See Cotte.)

DEERING. (See Gandy-Deering, John Peter.)

DEEWAN. Same as Divan, in senses *A* and *B*.

DEFLECTION. The act of turning aside or the state of being turned aside from the normal form or direction; especially in building, the bending of a horizontal or other member as a beam or post under a load, or by the force of pressure, heat, or the like. Deflection may be temporary or permanent. Every member has a limit of safe deflection, which limit varies greatly according to the material. Thus, a stone lintel cannot be said to receive any perceptible deflection without rupture; but an iron or wooden beam may be deflected very considerably from the normal and yet be able to recover itself perfectly in case the load is removed; or it may carry that load with safety for a length of time. — R. S.

DÉGAGEMENT. In French, a space rather restricted as to size, forming a connection between two rooms, or between a room and a more public place as a hall or passage; thus avoiding the inconvenience of opening adjoining apartments directly into each other, and giving more privacy. No exact equivalent exists in English; but the term may be more or less accurately translated in each case by such a name as vestibule, lobby, anteroom, or the like.

DEINOCRATES; architect.

This architect appears under various names: Dinokrates (Vitruvius), Dinochares and Timochares (Pliny), Cheirokrates (Strabo), Stasikrates (Plutarch), etc. The place of his birth is also variously given, Macedonia, Rhegion, and Rhodes. He was the favourite architect of Alexander the Great (b. 356; d. 323 B.C.), whose attention was attracted by his scheme for transforming Mt. Athos into a colossal statue. Deinocrates was employed to lay out the city of Alexandria (Egypt). He rebuilt the temple of Artemis at Ephesus.

Brunn, *Geschichte der Griechischen Künstler*; Vitruvius, ed. Marini; Plinius, *Hist. Nat.*; Wood, *Discoveries at Ephesus.*

DE JOLY. (See Joly.)

DEKASTYLOS. A decastyle building (Vitruvius).

DE LA BARRE. (See Barre, Eloy De La.)

DE LABORDE. (See Laborde.)

DEL MORO, LUIGI. (See Moro, Luigi Del.)

DE L'ORME, JEAN; engineer and architect.

A brother of Philibert de l'Orme (see De l'Orme, P.). He followed his brother to Paris, and Jan. 13, 1552, succeeded Gilles le Breton (see Breton, Gilles le) as *maître genéral des œuvres* at Fontainebleau. In the same year he went to Italy to fortify the cities of Parma, Siena, etc., which were then garrisoned by the French.

De Laborde, *Les comptes des bâtiments du roi*; Chevalier, *Archives de Chenonceau*; Bauchal, *Dictionnaire.*

DE L'ORME, PHILIBERT; architect; b. about 1515; d. Jan. 8, 1570.

De l'Orme's father was Jehan de l'Orme, architect at Lyons, France. Berty supposes that he was related to Pierre and Toussaint Delorme (see Delorme, Pierre and T.), master masons at Gaillon. Various passages in his works point to 1515 as about the date of his birth. He went to Rome at nineteen or twenty, and in 1534 became a protégé of the learned Marcellus Cervinus, who was elected Pope in 1555 as Marcellus II. He was also employed by Paul III. (Pope, 1534–1549) at S. Martino del Bosco in Calabria. In 1536 De l'Orme returned to Lyons with the famous General Guillaume du Bellay and his brother, Jean du Bellay, the cardinal. The portal of S. Nizier at Lyons is ascribed to him. He followed the Cardinal du Bellay to Paris and began for him the château of *Saint-Maur-les-Fosses*. In 1546 he entered the royal service charged with the inspection of fortresses in Brittany, and distinguished himself by defending the city of Brest against the English. Jan. 29, 1548, he was designated *architecte du roy* and April 3 was appointed *inspecteur des bâtiments royaux* at Fontainebleau, Saint-Germain, etc. He also directed the manufacture of tapestry at Fontainebleau. Becoming the preferred architect of Henri II. and Diane de Poitiers, he was endowed by them with the benefices of five abbeys having a revenue of 6000 livres, and Sept. 5, 1550, was made a canon of Notre Dame (Paris). After the death of Henri II. (July 10, 1559) he was superseded in the office of *inspecteur* by Primaticcio (see Primaticcio). He retained his benefices, however, and his will, published in the *Archives de l'art français*, shows a considerable fortune. The palace of the Tuileries was begun by De l'Orme in 1564 under the personal direction of the queen dowager, Catherine de' Medici (b. 1519; d. 1589). His design contemplated an immense rectangle 188 m. long by 118 m. wide. Of this only the garden front was built, and of this front only the central pavilion with its connecting wings was by De l'Orme. His work was almost entirely remodelled by Jacques Lemercier (see Lemercier, J.), Louis Levau (see Levau), and D'Orbay in the reign of Louis XIV., and by the architects of Napoleon III. The palace was destroyed by the commune on the night of May 23-24, 1871. The château of Anet was the chief glory of Philibert de l'Orme. An inscription over the main portal dates the work between 1548 and 1552. The chateau was spared by the Revolution, but was sold Feb. 1, 1798 for 3,200,000 francs without its movables. Much of the architectural decoration was bought for the government by Alexandre Lenoir (see Lenoir, A.), assisted by Napoleon Bonaparte, then first consul. The portal of the main building stands now in the court of the *École des Beaux Arts* in Paris. The palace was then broken up for building material, except the left wing, partially restored in 1828. The chapel was restored by A. N. Caristie (see Caristie) and reopened Sept. 3, 1851. The tomb of François I. at Saint-Denis is the only work of De l'Orme which is now intact. The architecture is ascribed to him exclusively in the *Comptes des bâtiments du roi.* He became superintendent at Fontainebleau after the death of François I. and in the Salle du Bal substituted a fine ceiling of wood for the vault projected by Gilles le Breton (see Breton, Gilles le). At the château of Monceaux he first used the *couverture à la Philibert de l'Orme*, a method of building wooden roofs which substituted for single heavy beams planks bolted together "so that the junction in each case took place upon the centre of the piece by which it was doubled" (Pattison, op. cit.). There is a record of a contract with him dated Jan. 27, 1557, for the construction of the bridge and gallery at Chenonceau. In 1561 De l'Orme published, *avec privilège du roi* (Charles IX.), *Nouvelles inventions pour bien bastir et a petite fraiz*, etc., and in 1567, *Le premier tome de l'architecture*, etc., dedicated to Catherine de' Medici. The second volume never appeared. In 1858 M. Leopold Delisle discovered in the *Bibliothèque Nationale* a manuscript entitled *Instruction de Monsieur d'Ivry dict De l'Orme*, a personal defence of about 1560 which throws much light upon his career. It is printed in Berty, *Les grands architectes français.*

Vachon, *Philibert de l'Orme*; Berty, *Les grands architectes français*; Palustre, *La Renaissance en France*; Charvet, *Philibert de l'Orme* in *Annales de la Société Ac. de Lyon*; Lemonnier, *P. de l'Orme* in *Revue de l'Art*; Pfnor, *Monographie du château d'Anet*; Roussel, *Histoire et description du château d'Anet*; Mrs. Pattison, *Renaissance of Art in France*; Chennevières, *Archives de l'art français.*

DELORME, PIERRE; architect.

Pierre was one of the three principal architects of the château of Gaillon (Eure, Normandy), the others being Pierre Fain (see Fain, P.) and Guillaume Senault (see Senault). About 1502 he was employed by the Cardinal Georges I. d'Amboise (d. May 25, 1510) to make additions to the episcopal palace at Rouen. His name first appears in the accounts of the cardinal's château at Gaillon, Jan. 1, 1507. He built the so-called *Maison Pierre Delorme*, (destroyed) on the south side of the main court facing the *grande maison* of Guillame Senault. The *comptes* show that he was constantly employed at Gaillon during the life of the first cardinal. It is supposed that he was related to Philibert de l'Orme (see De l'Orme, Ph.).

Palustre, *La Renaissance en France*; Deville, *Comptes de dépenses du château de Gaillon.*

DELORME, TOUSSAINT; architect.

Toussaint was one of the architects of the château of Gaillon, and probably related to Pierre Delorme (see Delorme, Pierre). He was employed with Michellet Loir to decorate the gallery and terrace of the *grande maison* on the side of the château toward the moat.

Deville, *Dépenses du château de Gaillon.*

DELUBRUM. In Roman archæology, a sanctuary; a *temenos* or enclosure comprising a temple and sacred area; or, again, a shrine with a fountain of ablutions. The term seems to have had all of these and other similar meanings, in succession. (See Templum; which term underwent similar changes of meaning.)

DEMETRIOS; architect.

A priest of the temple of Artemis at Ephesus and one of the architects of that building. (See Chersiphron and Theodorus.)

Brunn, *Geschichte der Griechischen Künstler.*

DEMICIRCLE. (See Surveying.)

DEMIMETOPE. A half, or incomplete, metope in a Doric frieze; that for instance in a Roman Doric order between the last triglyph and end or corner of the frieze, though this is really less than half a metope. A demimetope is sometimes left on either side of a reëntering angle in the frieze.

DEMOLITION. The operation of taking down a building by the gradual and systematic removal of its materials, as distinguished from destruction by fire, explosion, or the like. In large cities, at least in the United States, it gives occasion for a distinct trade and business, those who follow it profiting chiefly by the sale of secondhand building materials from the demolished buildings. Demolition of old buildings requires care and system, and in cities must be carried on under special precautions against accident and against public annoyance from dust, dirt, and falling materials.

DE MONTFERRAND. (See Montferrand.)

DEN. A room especially reserved for the work or for the moments of leisure of a single person, in which that person's private property and preparations for work and the like can be kept together without disturbance. The term occurs as long ago as the middle of the eighteenth century, but apparently in a jocose sense. In the United States, and very recently, the term has become usual and is given to any private office or sitting room in a dwelling house, especially a man's private workroom. (Compare Boudoir.)

DE NEUFFORGE. (See Neufforge.)

DENHAM, SIR JOHN, K.C.B.; architect and poet; b. 1615 (at Dublin); d. March 19, 1688.

Denham came with his father to London in 1617. He took his bachelor's degree at Oxford, and studied law at Lincoln's Inn. He was created surveyor general of his Majesty's buildings by Charles II. Sir Christopher Wren was made his associate in 1661.

Arch. Pub. Soc. Dictionary.

DENMARK, ARCHITECTURE OF. The peninsula of Jutland as far south as Ribe, the islands of Zealand, Funen, Laaland, and Borneholm, with some smaller islands, are the territories properly included in Denmark. In considering the architecture of this region it is to be noted that its influence on the rest of Europe has been slight, and, however attractive the buildings are to the traveller, they have never been studied with any thoroughness. The earliest buildings of consequence are the round churches, of which four are in the island of Borneholm, one in the island of Funen, two in the island of Zealand, and one only on the mainland. They are generally alike in having a choir of comparatively great size, or, at least, of great length, and the entrance porch at the opposite side, sometimes carried up into a tower; these two members projecting boldly from the circle which constitutes the nave and its aisles, if the church has one. In this latter respect, some of the round churches have a complete system of pillars and arches carrying a clerestory, but the clerestory in at least one instance is square and carried by four piers; the square clerestory rising above the circular aisle roof without disguise. (See Baptistery; Round Church.) Other churches in Denmark are generally Romanesque, of a simple character such as corresponds to the plainer churches of the second half of the twelfth century in Germany. Such churches are the cathedral at Ribe and that at Viborg, both on the continent; and also the cathedral at Roeskilde, in which the nave is vaulted in parallelograms with their length contrary to the main axis of the church, and the aisles in parallelograms lying in the same direction as that axis; and which has an interesting deambulatory. At Aarhuus is a church of the thirteenth century, and with pointed windows, though not in any true sense a Gothic structure. The gables of the east and west ends and the smaller gables which front the roofs of the aisles, arranged like great dormer windows projecting from the nave roof, are all finished in brickwork in a style not unlike those richer ones at Lubeck and other cities of Germany. A curious church at Kalundborg is described as a cruciform church without aisles, and as having five towers, namely, a square one at the crossing and an octagonal one at the end of each arm of the cross. These octagonal towers are of different sizes, that at the principal entrance and that at the choir end being larger and finished with gables at all the sides of the octagon, while the other two have horizontal cornices throughout. It seems probable that the suggestion for this grouping of towers came from such great southern churches as the cathedral at Tournai (see Belgium, Architecture of); for the group of four slender towers surrounding a larger central tower must have had a powerful influence on the builders of the time. In fact, no group of towers known to us has greater possibilities, and it is to be regretted that the Gothic builders did not push the scheme to a final result.

It is interesting to note the marked interest which the Danish builders, like those of Sweden, took in the German neoclassic architecture of the sixteenth and seventeenth centuries. It is, indeed, not strictly accurate to hold the Danish work as in all respects suggested by German examples, as there are many signs of independent thought. Thus, at Copenhagen, a most interesting statehouse has a marked picturesque character due to the very lofty dormers which break the main roof in a fashion which reminds one of the château of Josselin in Brittany. The royal castle of Kronborg, near Elsinore (Helsingor) on the narrow waters of the sound, is treated in a similar way, but with this peculiarity, that the dormers are few —only three or four on each long face—and each of these is as large as a three-story house, while the great stretches of roof between are broken by very small dormers of wood covered with metal and without especial character. The still larger royal castle of Frederiksborg has five stories in the walls, and above these rise dormers almost as large as those of Kronborg; while towers of very great size, some of them ten stories high, some octagonal, and some square, stand at the corners and break the curtains of the great building. These buildings are mainly of the sixteenth century, at which time a decided movement in building seems to have prevailed. Later buildings, such as the Palace Schillemann at Copenhagen, are of the fantastic eighteenth century style; the Hermitage, a royal summerhouse, standing near the capital, is of 1740, but is much purer in style, with a really delicate design with Italian suggestions; and the principal royal palace of Christiansborg in Copenhagen, built about 1740, is also a simple and tasteful design with a very interesting open colonnade dividing two of the courts.

Neckelmann, F. S., and Meldahl, F., *Denkmäler der Renaissance in Dänemark*, Berlin, no date.

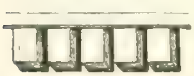
1 vol. folio; Helms, Jacob, *Ribe Dom-kirke*, Copenhagen, 1870, 1 vol. folio; Narjoux, Felix, *Notes de voyage d'un architecte dans le nord-ouest de l'Europe. Croquis et Descriptions*, Paris, 1 vol. 8vo, 1876; Helm, C. F.; Hansen, Heinrich, etc., *Danske Mindesmærker*, Copenhagen, 1869, 1 vol. folio.

A folio volume has been dedicated by J. F. C. Uldall to the churches of the province of Salling, and this reveals the existence of a whole class of small early churches. A French essay included in the volume deals with the granite churches of Jutland. — R. S.

DENTEL. Same as Dentil.

DENTICULATED. Provided or adorned with dentils; thus the caryatid porch of the Erechtheum has a denticulated cornice. The term is especially applied to one form of Roman Doric order in which dentils take the place of mutules in the cornice; in the cornice of the Doric order of the theatre of Marcellus at Rome both features appear, making it a denticulated mutulary cornice — the only example of its kind.

DENTICULE. Same as Dentil.

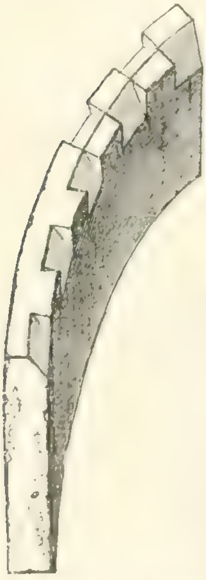


DENTILS.

DENTIL. A small rectangular block, forming one of a series closely set in a row, generally between two mouldings, and intended for ornamental effect by alternation of light, shade, and shadow. Rows of dentils are found under the corona of an Ionic or Corinthian cornice. One of the earliest examples is in the cornice of the caryatid porch of the Erechtheum, Athens; another is that of the Choragic Monument of Lysicrates, while in Roman Ionic and even Roman Doric buildings it is a very common feature. In the Roman Corinthian, also, there is a row of dentils between two mouldings under the modillions. The proportions of classic dentils vary considerably; in some of the best examples the width and projection are each equal to two thirds the height, and the inter-dentil or space is one third the height; which approximates to one sixth the lower diameter of the column.

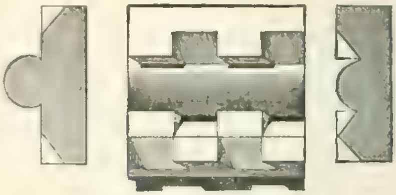
In Byzantine, especially Veneto-Byzantine, architecture a form of double alternating dentil is used: (see Venetian Dentil below. Called also Denticle. See Billet; Ionic Order.)

— A. D. F. H.

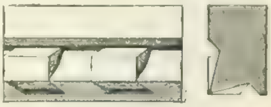


VENETIAN DENTIL, CUT IN THE HOOD MOULDING OF A WINDOW. DIAGRAM TO SHOW THE METHOD.

Venetian Dentil. One of a series of square blocks alternating with sloping surfaces, as described below. Also, the ornament so produced in general. A square-edged projecting fillet, or listel, is cut either on one edge or alternately on one and on the other side, so as to produce sloping surfaces which occupy half the width of the fillet. In this way a projection and a depression alternate along each cut side or edge of the fillet; the projections on one side, of the double cut form, corresponding to the depressions on the other. The same form occurs, though rarely, in French Romanesque. There are other forms of square-edged ornament peculiar to Venetian architecture, some of which deserve the name dentil as well as the above-described form, but the term is generally limited as stated. (See Notch Ornament.) — R. S.



VENETIAN DENTIL.



VENETIAN DENTIL.

DENTIL BAND. *A.* A rectangular moulding in the bed-mould of a cornice of classic type, having the profile and position of the dentils of the order, but without the interdentils being cut; it is as though the whole row of dentils had had the spaces between them filled up solid.

B. A band or flat moulding in a bed-mould, such as would be left by the stripping away of the dentils, the upper bed-mouldings being usually correspondingly set back; the same as *A* with diminished projection.

DEODATUS (ADEODATUS). (See Cosmati.)

DEPENDENCY. A building, wing, or room subordinate or serving as an adjunct to the main building or apartment. Thus the stables, kennels, servants' quarters, etc., are dependencies of a great mansion.

DEPETER. Same as Depreter.

DÉPÔT. In French, a place of deposit; hence, in England, and, especially, in the United States, and in composition, as "railroad depot," a station on a railroad. The term seems to have been employed in the first place to denote large terminal stations where much railroad property was stored; later, it became the common term for any station, and has been gradually replaced by the word station. In English, commonly without the accents.

DEPRETER. Plastering to which an irregular rough finish is given by setting small stones in it while soft. (See Mortar; Plaster; Rough Cast.)

DERHAM, ELIAS DE. (See Elias de Derham.)

DERN. Same as Durn.

DERRICK. A machine for raising, lowering, and moving weights. In its original and simplest form it consists of an upright leg, near the bottom of which is pivoted the lower end of an inclined boom, which is raised and lowered by tackles passing from its outer end to the head of the upright, and thence down to a windlass or similar machine. The end of the boom has, thus, three motions: vertical, lateral about the pivot, and radial; which feature distinguishes such forms of derricks from Cranes. The boom is provided with additional tackles for attaching to the weight to be moved. In modern times the term is applied to almost any form of hoisting machine consisting of one or two legs, guys, and tackle, and with or without a boom. — D. N. B. S.

DESAUBEAUX or **DESAUBEAULX, PIERRE**; architect and sculptor.

Desaubeaux worked on the château of Gaillon (Eure, France) at the beginning of the sixteenth century. Between 1520 and 1524 he made the bas-relief of the "Tree of Jesse," in the tympanum over the main door of the cathedral of Rouen, France. From 1523 to 1525 he worked on the monument of the cardinals d'Amboise at the cathedral of Rouen.

Deville, *Tombeaux de la Cathédrale de Rouen*; Bauchal, *Dictionnaire*.

DESCHAMPS, JEHAN (JOHANNES DE CAMPIS); architect and sculptor; d. 1280.

Deschamps made the plans of the cathedral of Clermont-Ferrand (Puy-de-Dôme, France), of which the first stone was laid in 1248.

Thibaud, *La Cathédrale de Clermont*, in *Revue de l'art chrétien*; La Faye de l'Hôpital, *Description de la Cathédrale de Clermont*.

DESCRIPTIVE GEOMETRY. A branch or department of Projection (which see).

DESGODETZ, ANTOINE; architect and archæologist; b. 1653 (at Paris); d. May 20, 1728.

Desgodetz was sent to the French Academy at Rome, as *pensionnaire du roi*, in 1674. Returning to Paris in 1678, he was made in 1680 *contrôleur* of the buildings at the château of Chambord (Loir-et-Cher, France). In 1699 he was made *architecte du roi* and in 1707 professor at the *Académie*. His principal book is the *Édifices antiques de Rome* (Paris, 1682), printed by order of Colbert at the royal expense. He published also *Des Ordres d'Architecture*; *De la construction des dômes, des églises, des palais*; *Des lois des bâtiments suivant la coutume de Paris*, etc.

Lance, *Dictionnaire*.

DESIDERIO DA SETTIGNANO; sculptor and architect; b. 1428; d. 1464.

Very little is known about his life. His most important work is the monument, in the church of S. Croce (Florence), of Carlo Marsupini (d. 1453), chancellor of the Florentine republic. He made also a charming tabernacle in the church of S. Lorenzo (Florence). Desiderio is mentioned among the sculptors who worked on the arch of the Castel Nuovo, Naples. He died prematurely at thirty-five.

Geymüller-Stegmann, *Die Architektur der Renaissance in Toscana*; Müntz, *Renaissance*; Perkins, *Tuscan Sculptors*; Vasari, Milanesi ed.; Vasari, Blashfield-Hopkins ed.

DESIGN (I.). *A.* The art and practice of so arranging forms and colours, or objects having form and colour, that there are reached certain definite results intended to be agreeable to the eye and to embody some idea of the designer. The term, signifying primarily Drawing (which see; compare also French, *dessin*, *dessiner*; Italian, *disegnare*; Spanish, *diseño*, *diseñar*), is so far unfortunate that it conveys the idea of putting the form and colour upon paper rather than the act of inventing. Invention would be a better term than design for the production of a new or partly new composition in form or colour, or both.

B. By extension, the art of bringing to completion any visible and tangible work of human thought and skill; thus, an engineer designs a locomotive, and his design for it is approved or disapproved. In a similar sense, an architect designs a building; that is, he plans it, imagines its exterior appearance, and the interiors of the halls and the larger rooms, and selects in advance the materials for all its parts.

The first object in designing a building is to so shape, connect, and arrange rooms and passages that they will best serve their purpose; and this includes the placing of windows with a view to admitting daylight in the right places and in the needed quantities, of sources of artificial light, of fireplaces and other sources of heat, and of doorways. Thus, if a bedroom be in question, the doorway should not, when the door is open, command a view of the bed or of the washstand or dressing table, and there should be at least one window which can be left to admit light and a current of air, without the necessity of exposing the bed to either. A bathroom should not have the bath tub, nor any other fixture, set against a window back. A dining-room must have the doorway to the service room or butler's pantry in such a place that the guests will very seldom have occasion to pass it. In each of these rooms, the door of entrance must be hinged in such a way that, until it is wide open, it will partly conceal the room within.

These and such other general rules apply to the separate rooms and to combinations of two or three rooms; but the design of the building involves the harmonizing of these special requirements with the more general ones of so arranging all the rooms on the ground floor and those of the second floor, and of other floors, that the flues will be carried up in such groups or in such close neighbourhood to one another that the number of separate chimney stacks will not be unreasonably great, that in no case shall a fireplace be set in an awkward or inaccessible corner, that walls and if possible even small partitions may be carried up through story after story so that none will be left resting upon the floor, and that the arrangement of the windows as seen from without is harmonious, agreeable, and in strict accordance with the style of the exterior, while, at the same time, they come perfectly well in the rooms themselves. In practice, it is found impracticable to do this unless the architectural design is allowed a certain picturesqueness of treatment. It is impracticable in an inexpensive house to provide at once for convenience and for stately and symmetrical exterior design. So with the equally great necessity of architectural effect within the building — the much desired stateliness is often wholly unobtainable in connection with perfect convenience; and a satisfactory result is only to be obtained when a certain freedom, as of picturesque and unexpected grouping of parts within, is allowed. The more expensive the building, the more easy it is, as a general thing, to obtain dignity both within and without in combination with fitness. At the same time it must be noted that the remarkable pieces of domestic architecture, the Italian palazzi and the French châteaux, and their like, were planned and built with a lavish use of space and materials, and with a disregard for the minor conveniences which have been discussed above, which would be impossible in a private building in the nineteenth century. A noble family, building a palazzo in Bologna or in Rome, seems to have been content with suites of large rooms opening into one another without convenient access to corridors, without closets or provision for the convenient placing of furniture of all kinds. The great size of the rooms and their high windows, which filled all parts with light, enabled them to dispense partly with the above-named conveniences, and to separate parts of a great hall or chamber by means of screens more or less permanent, and by curtains and the like. Moreover, in the days when this stately architecture was brought into being, family life had not as many requirements as to-day. It will be found that the designing of a house, large or small, for a family which proposes to live in the whole of it and which has a refined and exacting taste in artistic design and in practical convenience, is the most difficult problem which can be set the architect.

The case is different when a large public building is undertaken. It is generally found in such a case that there are no such well-defined and generally accepted rules of planning; and, moreover, that there is no one in official life connected with the city hall, the state capitol, or the palace under consideration who has any very accurate notions of what is required. Any such official who has a ready-made scheme for the plan of a building or a part of it is either overpersuaded or overruled, and in practice the architect is restrained only by the ideas concerning grandeur or beauty of some member of the building committee. The design is very apt to be made from without inward, and the exterior treated first. It is an exceptional thing, a courthouse or a legislative building in which the same minute care for convenience as is required in a private house should be combined with a magnificent or beautiful exterior. Such buildings exist; but they hardly receive more notice than buildings of much less merit; for the public are little likely to judge of the labour attending the plan, or of the success which has resulted from it.

On the other hand, a bank or similar business building may be the medium of very careful thought; for the important interests which are at stake and the necessity of providing for the rapid and easy transaction of business by many clerks of different degrees and different departments, and the need of perfect supervision of all these by the chiefs, makes the planning of such a building very difficult and very interesting. The safe or safes must be in exactly such relations to the cashier, the tellers, the bookkeepers, etc.; the position of the cashier's office is of extreme importance, the easy communication of this and the president's and perhaps of the vice president's office with the whole bank must be carefully considered; and if the building occupies more floors than one, or more levels than one in the same story, the result may be more successful but the labour involved is made greater.

In all such cases it will be found that a style of architecture which admits of very free treatment, in the ordinary use of the phrase, is better than one which requires rigid adherence to certain dispositions. It was urged, as one of the reasons for the adoption of mediæval styles of building, that such freedom was possible alone in Romanesque or Gothic art; that in these styles alone could a window be opened where it was needed, some doorways made small, others large, some rooms high, others low, and all with perfect facility for obtaining an architectural effect both within and without. The practice of the French designers of the last half century has gone far to prove the contrary of this proposition. The uniformly neoclassic character of the design of Parisian buildings, both for residence and for business, and the presence in the capital of a great number of highly taught and very sagacious architects, has brought into shape a style allowing of any diversity of size, of almost any irregularity of disposition, all architecturally disposed and all brought into a certain artistic harmony in at least the better instances. The very irregularity of the Paris streets, crossing one another at oblique angles, has developed a singular freedom of planning, and the apparently classical spirit of the exteriors has modified itself perfectly to these requirements without losing artistic character. The practice of Paris, then, seems to point to the following conclusions. (1) The architects of a given time and place should be nearly of one mind as to the character of their buildings, the general architectural style to be employed, and the general use of materials and the like. (2) The interior should be allowed to express itself very freely in the exterior by means of fenestrations, grouping of roofs, and the like. (3) The artist who undertakes a new building must really be content to give to it a great deal of patient thought and to elaborate his interior with constant mental reference to the exterior which is to accompany it. If these conditions are fulfilled, it appears that there may grow up in any country, among any modern people, an architecture with a certain satisfying quality, a certain intellectual merit appealing to our reason and our sense of the fitness of things. At present it does not appear that great artistic beauty can be procured in this way. That seems to be hardly within our reach because of that lack of intelligence in purely decorative work which is characteristic of all modern European peoples, and which has been referred to in many pages of the present work. — R. S.

DESIGN (II.). *Ancient Art and Modern Position.* Ancient styles of architecture had this in common, that they were all traditional. Even at the Renaissance the movement was a general one, and the style of building was only a reflection of a style-thought, although the inner principle was then gradually changed. Many a great mind dealt with architecture at this period, and many original characteristics were shown in individual works; but the central principle — the compelling idea from first to last — was a desire to show a mastery in the scholarship of ancient art. When this scholarship had covered the field of research, a break in the development was inevitable, and another point of departure in the scholarship of past art had to be found. The Gothic art of France and England was now explored and copied, but just in the same way that Roman art had been. The form only was Gothic, the principle was still the Renaissance one of scholarship. The consent to this Gothic Renaissance was not nearly so unanimous as the consent to the Renaissance proper, and, since the breakdown of the Gothic revival, we have had a series of attempts of the same kind; each of them, however, has embraced less ground and has lasted for a shorter time than the one before it. There is, perhaps, this difference in the two revivals, that in the former one scholarship was the avowed end, while of the latter one some people have said that the aim was to find a point of departure for a new growth; but in any case the departure was never made.

Others have hoped that a "modern style" would come of the use of new materials; but this is easily seen to be fallacious, as the real question is of the spirit which is to enlighten all our work, not of the matter of a small part of it. Is our architecture to be "modern art," when steel and aluminum are used, and not "art" when wood and stone are employed?

What is wanted is the art which shall use all materials in a fine and reasonable way, making the forms, moreover, carry some spirit-contenting quality which we call Beauty. In the second place we must raise the level of the whole range of building art instead of shutting out all but a small fraction from our purview; for the few supreme works will only spring up where there is a wide basis of good common building. Thirdly, we need some point of view which shall interest all the workers employed, for a building is no mere design; it is a thing shaped by millions of handstrokes, and these strokes must all be guided by intellect and heart. I claim for the sphere of modern architecture all buildings, all materials used in their construction, and all the workmanship involved in erecting them. The real purpose of our art is the expressive use of materials for the satisfaction of worthy needs. Ancient work should properly be used as a body of ready-made experiment and as a glass for self-criticism. Within the phenomena of the architectural styles there are certain large principles common to all vital periods, and it is these principles which will still form the positive conditions of modern architecture.

Although our wide and accurate knowledge of past art has been one of many causes for our present sterility in production, we shall best attempt to rectify this, not by seeking to forget the past, but by seeking another point of outlook, — a larger view and the recombination that follows minute analysis. He who at this time knows best what the constant spirit of past art has been knows best what its future may be.

All design is a dealing with certain problems in the light of a body of observation and experience. As to general arrangement, we are mostly agreed that the first consideration should be utility, and as to construction that it should be governed by stability. Beyond this, there is no agreement as to elements and no recognized basis of criticism, other than that of archæological correctness — judgment by authority; and modern architecture in this respect is in the position of early science before it was regenerated by the doctrine of the necessity of experiment. All criticism of art which is not a mere expression of "taste" comes to this, — it is either a statement of "authority" or it examines a work "according to reason." It is those *organon* of reason as applied to modern design which we are here concerned with.

Proportion. Before passing on, I should like to examine the scholastic theories of design, but I must content myself with a few words on proportion and symmetry. That there is in the nature of things a series of agreeable relations generally applicable is a dogma which has been almost unquestioned. But this perfect relation can only be in the agreement of the object with all its conditions, as a perfect tree is differentiated into palm or oak according to latitude, and these, again, in their size and character so as to be in harmony with the several soils, ruling winds, and so on. Proportion in architecture is nothing but a relation of parts conditioned by utility, materials, scale, and habit. All the talk about proportion, from Alberti to Chambers, only resulted in the copying of marble buildings in brick covered with plaster, and in fixing the relations of parts in buildings of different scale. Now, a true proportion can only exist when there is a just relation between weights and supports, and if the materials or the scale is changed this equilibrium is destroyed. For instance, increase the Parthenon, and the area of the supports is only increased according to the square, while the weight increases by the cube. Convenience again dictates much which passes for abstract proportion; for example, the ordinary two squares of a doorway; and doubtless if we were accustomed to roll into a room horizontally the "right proportion" of 3 feet 6 inches to 7 feet 0 inches would be just the other way about. Many attempts have been made to prove that the Gothic churches were set out by some method of squaring or triangulation; but the great latitude in the application of the squares and triangles — fitting them either to the inside, the centre, or the outside of walls, and then adding a margin for error — amounts rather to disproof, and the historical study of such buildings as Chartres and Westminster shows that they overlie earlier buildings, the foundations of which were the governing conditions in planning them.

Symmetry. An attempt has also been made to make a dogma of symmetry. There is (1) the symmetry in all directions, as the sphere; (2) the axial symmetry, as of a prism or a tree; (3) the symmetry to a plane, as of a man or a ship; (4) balance; (5) irregularity. What is usually meant by symmetry in architecture is symmetry on both sides of a vertical plane (3), and it is at once evident that it is a great and arbitrary limitation of the field. There is, however, this much in symmetry: where the purpose of a building is all gathered up at a centre there is likely to be an approximation to (2), or even, as far as possible, in some topes and tomb chambers, to (1). Where the purpose of a building develops as we enter it, as in an Egyptian temple, or where performers and audience have to be considered, a symmetry along the plane of action is certainly appropriate, just as the symmetry of an animal and a ship is to the planes of movement. Even where the purpose of a building is more complex, as in a house, it is probable that there should be always some attempt at balance of parts as expressive of thought and order; the extreme of irregularity, indeed, is unthinkable.

Order. The general law in regard to these abstract considerations is the desirability of order, which itself is based on convenience and on ideas derived from the harmony in nature's order.

Unity. A close study of examples of ancient art shows many minor adjustments of parts, such as the use of curved surfaces and inclined lines in Greek architecture. These refined modifications are often explained as if they were intended as optical corrections made for the purpose of making the square and the straight appear square and straight to the eye, which would otherwise misconceive them. The general principle is more certainly expressed in what a practical man would call "taking off the hardness," a harmonizing the quantities by mixing them; for instance, if we look at a man or a tree we see that every part is "shaded" into the next. We may find approximations to geometrical solids in simple objects, but we are not likely to find a cube or prism forming a part of an organism. A Greek portico contains the rounded surfaces of the statues, the cylindrical shafts, the inclined pediment, the vertical walls. The adjustments "sweetened" all these together. The ordinary theory fits only one point of view, and indeed is merely a front elevation (on paper) explanation. The "imperceptible correction" of the steps of the Parthenon, for instance, is a very obvious incorrectness, when the steps are seen from the end. The principle of "sweetening," on the other hand, is quite general, and the irregularities of Gothic work conduce to the same unity in the total result. In the simplest case it is desirable to have a mean between extremes, as for instance black, white, and gray, vertical, horizontal, and inclined; and three colours or tones, at least, are required to give colour.

Adaptability. Essential character is another desideratum, — every building and detail should be shaped so as best to express its typical character. A spire may be high; the glory of a dome is its expanse.

Beyond these general rules, which we gather from a wide observation of past art, — rules rather too negative and academically elegant for the practical builder, — there are other great conditions which must ever form the positive groundwork of all progressive schools of building.

Nature. Man's building work, when the product of healthy and stable conditions, is as much a part of nature as a bee's or a bird's. Harmony with the rest of nature is the great rule, and old building work is the crowning interest of landscape. "Architecture," says W. Morris, "means the moulding and altering to human needs of the very face of the earth." While the influence of nature on architecture is largely in a spiritual or epical quality, — to be seen in the work of the hands of those whose hearts beat close to the bosom of the earth, — nature will also furnish well-defined positive conditions which result in the differencing of local types where buildings are grown on the spot, and not "designed" through the post office. It is, moreover, as much the great reservoir of artistic ideas as of electrical force. All flourishing periods of art have been the result of a going back to nature, and naturalism has been one of the constant elements of style from prehistoric times to the present day. Now, it is with these constant elements of style that architecture as an idea is alone concerned. We must bury the dead body of the styles — improperly called "revived" when they are only exhumed — and open our hearts to nature. To get on practical designing terms with nature we must exchange the botanist's and painter's way of looking at the world for the observation of other facts of form and colour — the plan and pattern of things; but the highest purpose in ornamentation, as in all art, is the gathering out of nature of those particular facts and expressions best fitted for a given purpose. Give us fresh observations of nature, and it must delight us; give us scholarship, and at best we can only say that you are clever.

Tradition. By this group of positive conditions I mean the great store of past experience, remote or recent. To make these properly available, our present methods of studying the monuments must be reversed; instead of studying them archæologically we must study them as essays in practical building, under certain conditions. We should put aside the curious and the highly specialized, and look, on the contrary, for what was universal — the central stem of the development of building. If we will thus concern ourselves less with styles, and regard these old facts from our proper standpoint, the whole body of this past experience is ours to profit by. We should observe what results were the direct outcome of the use of certain materials: the enamelled brick encased walls of Assyria and Persia, the granite and marble monolith building of Thebes and Athens, and the solid mortar masonry of Rome. Having studied the wall, we might explore all the developments of arching, doming, and vaulting. The wall, the pillar, the arch are ours, but not the Egyptian or Romanesque varieties. We should get much more from such a process than from collecting drawings of "features" and trying to recombine them in the drawing-master designs we call Classic or Gothic. We should look at the piecing of the stones together in the plain wall, the texture of the plastering, the colour of the tiles, the durability of the cast lead, the method of applying rough cast. As builders we want the methods, not the results. But above all, we must use old art as an incentive and a witness to the fact that, of old, art had a message, and we must learn to read its final expressional result as a work of art. To attempt to revive one given style is to exclude the others; the whole of past art experience is ours, and out of the critical use of past tradition considered as a whole we must build up a current custom, a tradition of our own.

We must not study Greek as Greek, nor Gothic as Gothic; but see in them only phases of the one universal art. As we look into the mirror of history at the arts of men, we see that the images presented to us are not isolated; every phenomenon, every period, overlies and is interwoven with all the rest; all is movement, flux, and change, but all is one. Recognizing thus that not Classic or Romantic alone, but the whole of art is ours, we see that the essence of revivalism must be in not being open to the influence of past art, but in arbitrary shutting off of all but one set of influences. The student of architecture should seek to estimate the value of this or that structural method for present-day materials and common needs, and try to read the expression of old art so that he may learn to express to-day's motives. Let him, in a word, so far as he studies past art, classify his observations in structural and artistic categories, and not according to geography and chronology. The one will prove a knowledge of art; the other a knowledge about art. Whatever suggestions he gathers in this way must be purged of the local and particular; for instance, we may learn much about building with large stones from the Greeks, but there must be no pretence of Ionic or Doric in modern art. We may learn much of story and romance from Gothic work, and certain methods of handling from the Renaissance; but there must not be anything deliberately mediæval or Italian allowed to remain in our own work.

Need. A third cornerstone of a positive foundation for modern design is Utility. At first sight there seems little danger of this being forgotten, for supply and demand are very well adjusted. But need does not mean the same thing as demand, and a wise consideration of what are true needs would carry us far and give us nearly all we want. This lowest, firmest ground for art should at once — if we could only realize the things which we really require — give us a well ordered country, clean towns, workmanlike building, bright colour, light in our rooms, and shelter at our doors, and we should not for long lack an interested public — intelligent craftsmen, and beauty would soon spring up by the way, for beauty is to art what happiness is to conduct. I do not think that it is possible for a work at the present moment not to recall some one phase of past art more than another; but these stigmata of the styles are measures of our weakness, not of our strength; and if it is impossible to get a "design" together without Greek or Gothic, it would be possible, when it is once made, to hunt out every known trick of style, pilasters, eggs and tongues, pinnacles, gargoyles, and all the rest; and then to make a concentrated appeal to the imagination in some little panel of sculpture or piece of precious material.

Materials. A fourth group of positive conditions, those given by the materials we use, is in many respects the most important of all. It is not by an impossible return to some art Eden, a general agreement as to a point of departure and a point of view, but by a commonsense adaptation of means to ends by reasonable methods of workmanship, and by the simple expression of our delight in making things, that we shall form a school of art.

Beyond the initial impossibility of our doing work like the old, because we are modern, there are further impossibilities as to materials and labour. For instance, in the Middle Ages it was often cheaper to use timber in large bulk rather than to cut it down with great labour; and an Elizabethan author tells us how the curved braces in old timber-framed houses "came of husbandry in dealing with their materials," and what before was rejected as crooked "doth now come in the fronts and best parts of the work." Thus, the naturally bent timber, by the excellent device of the craftsman, became a new beauty, and such economic development has ever led to new forms. And this is the reason that none but those who deal with materials at first hand can design anything really fresh and lasting. Consider this further, not only in regard to the materials, but to the tools. All right "finish" of surfaces and appropriate ornamentation are direct outcomes of the tools in the hands of a thinker; a potter, for instance, thinks with his thumb. He may begin with an idea, but the pot insists on developing in its own way. If, however, a "designer" attempts to design a pot he can only at best generalize a notion from a number of pots done by potters. How can any one not a glass blower know in any fresh way what good form or workmanship in glass is? The same consideration applies to textiles and all other arts; the Greek ornamentation, which has been copied by thousands of miles for hundreds of years by connoisseurs of exquisite taste, was developed at the brush end by common pottery painters; and our very alphabets, as is acknowledged, were never designed by grammarians, but changed in form as the tool used in writing changed. All ornamentation may be defined as worthy thought expressed in the language of the tool. Once, long ago, a Chinese potter found that a certain pigment fired on a certain body produced a heavenly blue. Another found that baking under certain conditions made the glaze crackle. A Persian found out lustring; and another liked the accidental running of colours we admire in Rhodian ware. What is true of these is true of building. Suppose a doorway is needed, or a font, or capital; a man who knows how stone is obtained in convenient sizes, and who knows its pleasant qualities of surface when treated in a certain way, tries, by the smallest modification of the original masses, to get a suitable form for the jamb, or bowl, or weight bearer. This is the law of all stone design and the line of evolution of all fit mouldings; the best figure sculptures, even, are those in which the final work still retains the evidence of the log or block from whence they were hewn. This, indeed, is one great distinction between ancient sculpture and modern figure work: one was cut out of a block of stone by the thinking workman; the modern method has been to finish a full-size model in clay, and copy that into stone. In building, this "blockiness" is of the greatest importance, our power of following the reasoning of the workman being of the essence of our pleasure in a work of art. All the details of a building should first be functional, of the nature of bearing blocks, sheltering projections, protecting margins, and so on; and then each one must be made suitable for its special purpose by special thought. It thus becomes organic and truly original.

Moulding is a minor modification of form, often done for a useful purpose, as for rounding an edge or forming a drip. It is usual to confuse moulding with the objects moulded; cornices or architraves, if functional, are not necessarily moulded. All our merely ornamental cornices are to be traced back historically to the fact that when the early Greeks built temples with mud walls they projected the wooden rafters to form a shelter, and put a wide terra-cotta gutter, forming a cyma, on the top. "A bold plaster cornice" around a drawing-room is a modern plagiarism of Greek thinking.

All consideration of architectural results leads us back to material determining conditions, and there are infinite possibilities open for natural growth to that architecture which shall once again examine the groundwork. When a serious general interest is taken in erecting buildings for noble uses, we shall find in these considerations of materials, need, tradition, and nature, all that is required to build up a positive style of architecture.

Beyond this, fine schools of architecture show evidence, in their expressional result, of the ruling thought of the several ages of which they were part: the hieratic mysticism of Egypt, the political culture of Greece, the vitality and romanticism of Mediæval Europe. This quality, which I venture to call expressionism, is, in truth, present in all work to those who can read the language of men's art; it is only a question of greater or less nobility at Athens or Amiens, or London and New York. Poetry has been said to be a criticism of life; all serious art is a criticism of ourselves, and exactly what we put into the constructive argument will tell in the result: choice of material for its lastingness, harmony with environment, careful workmanship, skilful adjustment, — all these are written across it, and these form its proper style.

One final word in regard to our own contemporary and future style, to express dissent from those who would call it eclectic. Let those who pursue eclecticism as an ideal call themselves eclectics, by all means; but so far as modern work is growing and coherent, based on the right handling of material, it is not eclectic. Is this modern spirit in art best left otherwise unnamed, or is there something in a name which reacts on thought and precipitates ideas which before only floated in the mind vague and unfixed? I incline to the refusal of all labels. Naturalism will not do unless it is stretched to cover the crudest abstraction; nor realism, unless it includes the uttermost of romance; nor humanism, which has been limited by association with the renaissance. But if a name must be found it should be wide enough to include all these together and to cover the whole ground between the four cardinal points of art — nature, tradition, requirement, material. Might the builders and craftsmen amend the impressionist art of the painters into expressionist art!

W. R. Lethaby.

DESJARDINS, ANTOINE; architect; b. July 25, 1814 (at Lyons, France); d. 1868.

Desjardins studied architecture first at Lyons, and afterward entered the atelier of Jaques Félix Duban (see Duban, J. F.) at the *École des Beaux Arts* (Paris). In 1848 he was made diocesan architect at Lyons, and in 1854 architect in chief of that city. At Lyons he restored the Hôtel de Ville and built the new wing of the *Palais des Arts*, the monumental fountains of the *Place Louis XIV.*, and the *Place de l'Impératrice*, etc.

Maurice du Seigneur, in Planat's *Encyclopédie de l'architecture*.

DESPATCH TUBE. The conveying tube or pipe in a pneumatic despatch system.

DESSUS DE CHEMINÉE. The space above a chimney piece treated architecturally, or filled with a painting or other work of art. This definition excludes the hood of a mediæval chimney, and includes only the treatment of the flat piece of wall forming the front of the chimney breast, and usually applies only to a panel, canvas, or the like which fills but a small part of it. The family portrait or other large picture which often occupies the space above the mantelpiece in old English houses is hardly called by this name, which implies rather a treatment in strict accordance with the architecture of the room.

DESSUS DE FENÊTRE; DESSUS DE PORTE. In interior decoration the space above a window or door which, in the styles of the eighteenth century, was often filled with a painting of importance or a carved and partly gilded panel. The terms have been to some extent Englished, as over-door panel, and the like.

DESTRÉ, JULIEN; architect.

In June, 1651, Philip IV. of Spain (b. 1605; d. 1665) authorized the construction of the Hôtel de Ville at Lille (Nord, France), then a city of Flanders, and under the dominion of the Spanish crown. The following year the plans were presented by Julien Destré, *maître ingéniaire et architecte*, according to which the building was constructed.

Palustre, *La Renaissance en France*, Vol. I.

DETAIL. In building, or the design for a building, a part small in proportion to a larger whole. Thus, the details of a church include not merely each separate sculptured capital, base, traceried window, or the like, but also the whole of the porch, of a flying buttress with its pinnacle and the sculpture decorating it, etc. If one were to make a *relevé* of S. Peter's, in Rome, the separate drawing in which the curvature of the dome was accurately plotted would be the drawing of a detail, or, in other words, a detail drawing; and in like manner the careful representation of one of the capitals, or of a single panel of the mosaic within, would be a detail; but so would be a drawing of one whole section of the dome with its panels of mosaic in their due succession. Details, then, and the drawings of details, are treated here altogether purposely, because it is mainly in connection with the preparation of designs that the term is used. One rarely speaks of the details of an existing church porch from which he is receiving pleasure, though it would still be common to say that the porch was fine in detail.

A subject which has not received sufficient attention is the extraordinary effect of elaborate detail upon the general design of a building. It is rather customary to speak of the general composition as if it could be considered independently of the details, large and small. In fact, however, the whole of the effect of a large building may be greatly enhanced or marred by the disposition of details, even if they are as small as the sculpture of architraves or of capitals. Any one who is familiar with watching buildings in process of erection will have noted that those buildings which are enriched with sculpture are very greatly modified by the completion of that sculpture in cases where it is wholly or partly executed after the stones have been put in place. The library of S. Mark's would be altogether different in its effect upon the spectator if its sculpture were removed from the spandrels, the smaller and the greater friezes, and the parapet. Buildings which are to be completed without the use of sculpture should be designed with a view to the effect which they may be made to produce without the assistance of such detail; and those buildings which are not to have arcades, colonnades, piers, parapets, bay windows, towers, or similar breaking up of the surface and variation of the sky line should be designed with a view to doing without them. This requirement, which seems obvious, is so often disregarded that we all see instances of a church intended to have a tower in the future standing many years without this tower. Evidently, something is wrong here; either the design does not require the added detail of the tower, in which case it will be spoiled by this addition; or it does require that detail, and should not be shown without it. Or if a tower bears too large a proportion to the whole design of a church to be considered a detail, the same truth holds with regard to a projecting porch, or to the addition of granite columns with carved capitals and bases, or even to the mere carvings of parts which have at first been left plain.

The most frequent solecism which is committed by designers who are thoughtless of these requirements is the taking of details from highly decorative buildings of the past to use in plain buildings of to-day, or the reverse. The same order which suits well the elaborate and very rich library of S. Mark would be a feeble thing if seen in a building deprived of other decorative detail. (See Composition I.; Grouping; Plan; Projet.)

Modern writers have seldom interested themselves in architectural detail, because the tendency of architectural designing is away from the combination of details to make up a whole, and in favour of designing buildings with a single eye to massing and proportion, and the later addition of highly wrought sculpture and painting. The use of detail in Roman imperial work, in which many interesting questions were solved and much valuable experience gained, has not been studied in modern times; but see the bibliography under Roman Imperial Architecture. The Romanesque and Gothic detail only has been carefully studied. (See bibliography under each of those terms.) For the extreme view of the value of detail to a building, see Ruskin, *Seven Lamps of Architecture* and *Stones of Venice;* and note especially the often cited chapter on the "Nature of Gothic" in the latter work. — R. S.

DETAIL DRAWING. A drawing showing the details of a composition, or parts of them. Such drawings are commonly made of full size, or on a scale two or three times greater than the general drawings.

DEVICE. A pictorial or sculptured design, usually emblematic or symbolical, expressing a sentiment and often accompanied by a motto in which the same or a similar sentiment is put into words. The device (called also *impresa* or *imprezza*) was common in the sixteenth and seventeenth centuries, and a simple one or a single element or part of one is often found in architectural decoration. The device is freely taken by any person at pleasure; and it differs in this from heraldic bearings (see Arms) which are always the direct gift or "grant" of a superior authority.

DE WAILLY. (See Wailly, Charles de.)

DIABASE. A dark gray to black igneous rock, composed essentially of augite and a soda-lime feldspar. Also called trap and more rarely greenstone. — G. P. M.

DIACONIA. A chamber or building dependent upon a church and placed under the care of a deacon, for the relief of the poor, aged, or infirm; either as a hospital, asylum, or place for dispensing charity. The term is mediæval, though it is said to be still used in Germany.

DIACONICON; DIACONICUM. *A.* Originally, a place in which the deacons kept the vessels used for the church service; hence, —

B. Formerly, in general ecclesiological usage, a sacristy. In Greek churches, a room corresponding to the sacristy of a Western church, usually on the south side of the *bema* or *sanctuary.* (Compare Prothesis.)

DIAL. *A.* An instrument for determining the hour of the day by means of the shadow cast on a graduated surface. In its simplest form, the non-portable dial consists of an iron rod fixed in a wall, its shadow moving over a series of radiating lines painted or cut on the masonry below. (See Sun Dial.) Hence, —

B. Any similar graduated surface, especially when circular; as the face of a clock or metre.

DIAMETER. *A.* An imaginary line through the centre of a circle or sphere, and terminating in the perimeter or surface; a similar line in a circular cylinder.

B. The length of a diameter in sense *A.*

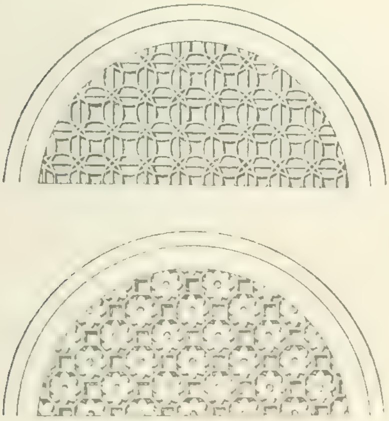
In the system of proportions devised by the Italian architects of the classic revival (Vignola, Palladio, Scamozzi, etc.) for the classic orders, the diameter of the lower part of the shaft of a column was taken as a standard of dimension for all parts of the order. It was divided into two modules, and these into "parts" or minutes, twelve for the Tuscan and Doric, eighteen for the Ionic, Corinthian, and Composite orders. Other writers have used other subdivisions.

This highly artificial analysis of the proportions, establishing a rigid and arbitrary canon, was evidently unknown to the Romans, although with their love of system they developed certain traditional rules, more or less flexible. Vitruvius gives certain of these, employing the term *crassitudo* for the diameter of the shaft as a unit for certain measurements and spacings; but he does not make it the basis of a whole system of detailed proportions as do the Italian classicists. (See Column; Intercolumniation; Order; Shaft.)

DIAMICTON. A kind of masonry used by the Romans and described by Pliny as having the body of the wall "stuffed" (farcire) with broken material. The description would fit almost any of the massive ancient masonry in the city of Rome.

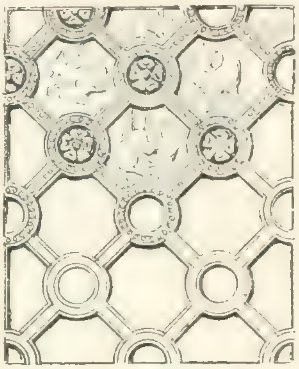
DIAMOND. Generally the same as lozenge; sometimes a square when set diagonally, or with its diagonals respectively vertical and horizontal. The term is scarcely to be considered as technical and is of very loose application.

DIAMOND WORK. A kind of mason work in which the pieces are set so as to form diamonds on the face of the wall. (Compare Opus Reticulatum.)

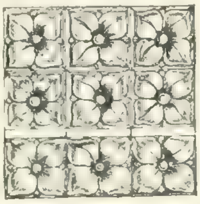


Diaper: El-Barah in Syria; 5th to 6th Century.

DIAPER. A pattern for the decoration of a flat or unbroken surface, consisting of the constant repetition of one, two, or more simple figures which connect with one another more or less closely. A pattern consisting of entirely separate figures as where a fleur-de-lis is repeated at small intervals, is not a diaper but a sowing, semé, or sprinkle; the diaper must cover the ground continuously, the figures flowing or passing into one another. Thus, if a broken or waving line constantly repeated and constantly crossing itself divides the surface into alternations of larger and smaller convex and concave spaces, and if each one of these spaces is occupied by a piece of leafage, or the like, that is a diaper in the strict sense of the term. The name is evidently derived from the terms in different languages signifying jasper, and refers to the decorative effect of veining and the like; although this is familiarized by being prepared for constant uniform repetition. — R. S.



Diaper on Doorway, North Side of Choir (Porte Rouge), Notre Dame, Paris.



Diaper from the Monument of William de Valence, Westminster.

DIASTYLE. Having columns spaced with a clear intercolumniation of three diameters. Some authorities give four diameters, but this may refer to the spacing from axis to axis. (See Intercolumniation.)

DIATONOUS (pl. -oni). In Greco-Roman work, going through a wall; said of a bond stone.

DIAZOMA. A passage or aisle in a Greek theatre concentric with the outer wall and with the orchestra, and communicating with the radial aisles. There was usually only one diazoma, dividing the auditorium at about the centre.

DICKINSON, WILLIAM; architect.

Between 1671 and 1680 Dickinson superintended the erection of S. Bride's church, London, from designs by Sir Christopher Wren. He was surveyor of Westminster Abbey in the early part of the eighteenth century.

Redgrave, *Dictionary of Artists.*

DIDRON (AINÉ), ADOLPHE NAPOLÉON; archæologist; b. March 13, 1806; d. Nov. 13, 1867.

Didron began with the study of law. Turning his attention to archæology, he was appointed secretary of the Comité des monuments historiques newly established by Guizot. In 1844 he established the *Annales Archéologiques*. Didron published *Iconographie chrétienne, Histoire de Dieu* (1 vol. 4to, Paris); *Manuel des œuvres de bronze et d'orfèvrerie du moyen âge* (1 vol. 8vo, 1859); *Iconographie de l'opéra* (1 vol. 8vo, 1864); and numerous important contributions to the *Annales Archéologiques* and other archæological journals.

De Guilhermy, *Didron* in *Annales Archéologiques*, Vol. 25, p. 377; *Notice Nécrologique* in *Revue Générale*, Vol. 25, 1867.

DIE. The body of a pedestal between the base and cap, especially when its form approaches a cube or rectangular prism.

DIENZHOFER. (See Dinzhofer.)

DIE SQUARE (adj.). Having accurately finished faces forming true right angles and arrises; said especially of timber when carefully dressed for fine work.

DIETTERLIN (DIETTERLEIN), WENDEL, architect, painter, and goldsmith; b. 1550 (at Strassburg); d. 1599.

Dietterlin owes his reputation to his work on civil architecture in five books, the different books appearing under different titles between 1593 and 1599. He painted the ceiling of the great hall of the *Lusthaus* at Stuttgart with the *Creation of the World* and the *Last Judgment*.

Seubert, *Künstler-lexicon*; *La Grande Encyclopédie*.

DIGLYPH. A member having two vertical channels or grooves, without the two lateral half grooves which characterize the triglyph. The diglyph is almost unknown in classic architecture, the few illustrations given in old works being of doubtful accuracy. (See Triglyph.)

DIKE. Originally a trench, a digging of any sort. In modern usage, a raised embankment or wall, thick in proportion to its height, and intended to resist the pressure of water. The embankments which keep the sea from overrunning the shore of the Netherlands are called dikes, and the Mississippi levees are dikes also, though not so called. A dike differs from a dam in keeping water out rather than restraining the flow of water, as of a river; but the distinction is not absolutely maintained.

DILAPIDATION. Technically, and in English legal usage, the act of injuring or allowing injury to be done to property which is held for a time. The term includes destruction and taking down as well as the result of neglect. In ecclesiastical law, the term is especially in use because an incumbent of a benefice is bound, under certain limitations, to keep the lands and buildings of his residence in good order; and because the appraisal of the injuries which have befallen them during the incumbency of any one person is a matter of very serious consideration and thought, certain surveyors being particularly engaged in this practice.

Fletcher, Banister, *Dilapidations, a Text-book for Architects and Surveyors in tabulated form*, 4th ed., London, 1891, 1 vol. 12mo.

— R. S.

DIMENSION. (For the dimensions of important buildings, see Size.)

DIMENSION LUMBER. Lumber which is accurately sawn to certain specified or fixed dimensions, especially of relatively large size. More specifically, in the United States, such lumber larger than scantling. (See Lumber.)

DIMENSION STONE. Ashlar, or cut stone, as distinguished from rubble; especially when cut to more or less accurately specified dimensions. (See Ashlar; Masonry.)

DIMINISH (v. t.), to make smaller; (v. int.), to become smaller.

The verb and its derivatives are used in connection with the tapering of shafts of columns from the largest diameter at the base to the smallest at the necking of the capital; with the narrowest rail of a panel door, which is usually at the top and so named in contradistinction to the lock rail in the middle and the bottom rail; to an arch which is less than a complete semicircle in curvature, etc. The term diminishing of a column or diminishing column is sometimes used for shafts which are conical merely, as distinguished from those which are cut with an entasis. Most shafts in mediæval work are cylindrical, that is to say, have no diminution at all. — R. S.

DIMINUTION (as of a shaft). (See Diminish.)

DINGLE. In local United States' usage, an enclosure constructed about an entrance, as a protection from the weather (C. D.). (See Weather Door, under Door; Wind Porch.)

DINING ROOM. The principal room used for meals, and in which the family in a private house, or the guests in a hotel, or the like, come together at mealtimes. It is most generally the only room used in this way, but compare Breakfast Room; Café; Lunch Room. (For the dining room in the Roman house, see Cenaculum; Œcus; Tablinum; Triclinium.) In the United States, it is generally held that the service room or the butler's pantry should be closely connected with the dining-room, and also with the kitchen. Thus, in country houses, the whole plan is very seriously affected and the freedom of planning seriously impaired by the desire to bring these three important rooms into close touch with one another, while at the same time the dining room is required to have a given exposure, as toward the sunset or toward a certain view supposed to be very attractive at a certain hour. The demand for a very short route from the kitchen to the dining room through the service-room is not so decided on the Continent, or even, perhaps, in England, the difference being partly caused by the more general employment by the wealthy of well-trained domestics in sufficient number. It is a plan not without its advantages in summer time and in warmer climates for a good part of the year, to have the meals served in a large hall which may answer for other purposes, as for the principal family sitting room. In fact, except for the lingering odours of certain dishes, the use of the sitting room for meals has many advantages; the room can thus be made much larger, and in strictly family life nothing that is disagreeable, and much that is pleasant, results from this arrangement. The requirements for a dining room of a club or hotel are obvious, such as facility for ventilation, the supply of abundant light, and perfect ease of access for the domestics on the one hand, and the guests on the other. — R. S.

DINOCRATES. (See Deinocrates.)

DINZENHOFER, KILIAN IGNATZ; architect; b. Sept. 1, 1690 (at Prague); d. Dec. 17, 1752.

The family of Dinzenhofer came originally from Bamberg in Bavaria, where were several architects of that name. His father, Christoph, was an architect, practising in Prague (Bohemia). Kilian went to Vienna in his twentieth year and worked with Fischer von Erlach (see Fischer von Erlach, J. B.). He travelled in Italy, France, and England, and settled in Prague after the death of his father, in 1722. He was employed on nearly all the most important buildings undertaken at Prague at this time. His chief work is the cupola of the church of S. Nicholas, at Prague.

Allgemeine Deutsche Biographie.

DIORAMA. *A.* A large picture arranged for public exhibition in a dark room and made almost deceptive by means of optical illusions effected by the illumination. Hence, —

B. A building especially arranged for the accommodation and exhibition of such a picture. Sometimes with a revolving room or "spectatorium," as in that erected in London in 1822, by Morgan and Pugin. (Compare Panorama.)

DIORITE. A dark, usually greenish to black, igneous rock, composed mainly of hornblende and soda-lime feldspars; also called green stone and trap. — G. P. M.

DIOTO-SALVI; architect.

One of the most important of the successors of Buschetus (see Buschetus). His name and the date of foundation, 1153, are found in an inscription of the baptistery and in an inscription of the church of S. Sepulchro in Pisa (Italy).

Rohault de Fleury, *Monuments de Pise*, p. 54.

DIPLINTHIUS. In Roman building, a particular form of brick. The exact signification of the word is uncertain; perhaps a brick of double the standard length, to be used as a header in a bond course. (Vitruvius, II., 8; see A. P. S., s. v.)

DIP PIPE. In Great Britain, the short vertical pipe connecting a water closet with a D trap (A. P. S.). (See under Trap.)

DIPTERAL. Composed of, or provided with, two rows of columns; especially when applied to a Greek temple, having two rows of columns on all sides. (See Columnar Architecture.)

DIPTERON; **–OS.** A dipteral structure (Vitruvius).

DIPYLON. In Greek, originally, an adjective; "having two doors or two gates." Used absolutely, and also in Latin, the gateway of the city of Athens, on the side toward the ceramicon (keramikos); also, the temple or shrine of Janus. The Athenian gate is celebrated because in the immediate vicinity was a cemetery in which have been found many splendid specimens of the Greek funeral *stele.* It is also the only gate of which some vestiges are left.

DISCHARGING PIECE. Any piece or member so disposed as to relieve a supporting member of a load that would otherwise be imposed upon it, and to transmit or discharge the load to another point or points. (See Discharging Arch, under Arch.)

DISH (v.). To form with a depression of the surface, generally for the purpose of retaining water; as to prevent overflow. A dished slab to a washstand is one having the general surface depressed slightly, leaving a rim about the edges.

DISH OUT (v.). *A.* To construct a frame or cradle, for a cove or similar curved surface; as by curved ribs at the meeting of a ceiling and wall.

B. Same as Dish.

DISINTEGRATION. The destruction of the cohesion of the particles of which a body is composed; especially as applied to stone. It is generally due to the destruction of the cementing substance by the action of frost, or water, etc., as water which has been absorbed into the pores of the stone, in freezing expands and throws off grains and even scales from the surface.

Like corrosion, disintegration can only be prevented by the application of a coating which will keep out the disintegrating force, generally freezing water, from the pores of the material. In some cases the action is chemical, as formerly in the smoke-laden atmosphere of London, that of sulphuric acid acting upon the carbonates of lime, etc. A coating of silicate of lime is efficient as a protection for some years. Various other substances and processes are on the market for this purpose, some of which are applied with heat. (See Preservation.)

For works of importance, stones should be [illegible] which are the least absorbent, in which the [illegible] of the pathogens is most resistant, or whose chemical constituents are least liable to be injured by the gases to which they are to be exposed. — W. R. H.

DISPENSARY. Primarily, that branch or department of a hospital which has to do with the *dispensing* or giving out of drugs and other things necessary for the treatment of the sick. By extension, and in the large cities, an office in which out-patients are treated, usually at a very low rate, or free of charge. The term is even applied to that branch of a surgical, orthopaedic, or ophthalmic hospital where relief is given by simple operations. Such establishments are [illegible] and regulated by law.

DISPOSITION. The placing of the different parts of a building; whether, in plan, the different rooms, passages, staircases, closets, and the like; or, in the exterior, the chief masses and the larger and smaller details. The term may be thought synonymous with Distribution, but there is perhaps a tendency to apply Disposition to the placing of any one part of the building, or of any one principal design, with its appurtenances; while Distribution applies only to the arrangement of many parts taken together. Thus, one might say that the disposition of the dining room is excellent, meaning thereby its placing with regard to the exterior and to the other rooms of the house; and would say of all the rooms taken together that the distribution was excellent. (See Design; Grouping; Planning; Proportion.) — R. S.

DISSECTING ROOM. A room necessarily large and perfectly well lighted in which dissections of the human body are carried on for the anatomical instruction of students in medicine and surgery. Apart from a large bare room, the requirements are merely abundant opportunity for washing, large cloak rooms, usually furnished with separate lockers for the students and demonstrators, in which the outer protective garments used in the dissecting room can be kept; refrigerating chambers for the preservation of subjects; a crematory furnace in which great heat can be maintained without danger to the building; and a most elaborate system of forced ventilation. The ideal dissecting room should be closed to the external air and should depend upon the ventilation alone for its sanitation and comfort; but it is hard to induce building committees to accept this proposition even when the dissecting room is practically unused through the summer months. — R. S.

DISTEMPER. Same as Tempera.

DISTEMPER GROUND. A surface properly prepared for the laying of colour in distemper, as described under Tempera.

DISTILLERY. A building or buildings, or a part thereof, for distilling liquids of any kind, especially spirits.

DISTRIBUTION. (See Disposition.)

DISTYLE. Having two columns in front; a term used in describing the plans of classic buildings. (See Columnar Architecture.)

DISTYLE IN ANTIS. Having two columns in front between antæ; used of temples or shrines whose front porch (*pronaos*) is formed by prolonging the side walls of the cella in front, finishing them with antæ, and placing two columns between them, as in the temple of Themis at Rhamnus. (See Columnar Architecture.)

DITRIGLYPH. *A.* In a Doric entablature the space from the centre of one metope to that of the second metope from it, including thus two triglyphs.

B. In a Doric building, a space between two columns such that two triglyphs intervene over the intercolumniation instead of one, as in the ordinary arrangement.

DITRIGLYPHIC. Arranged with a ditriglyph.

DITTON, JOHN DE; architect.

In 1320 he was appointed clerk and keeper of the king's works at the Palace of Westminster and at the Tower of London.

Arch. Pub. Soc. Dictionary.

DIVAN. *A.* A council chamber, court, or state room, especially in the Levant or among Mohammedan peoples generally.

B. A room, especially in the Levant, having one side entirely open, as toward a garden, and a floor raised by one or two steps.

C. In the West, a broad and long seat, composed of a mattress or long cushion either laid directly on the floor or upon a low bench, generally against the wall; distinguished from a sofa or lounge as having no back or arms, and as being more or less stationary. A similar raised seat or couch is called in the Levant a lewan, and the word divan or deewan is used for the apartment.

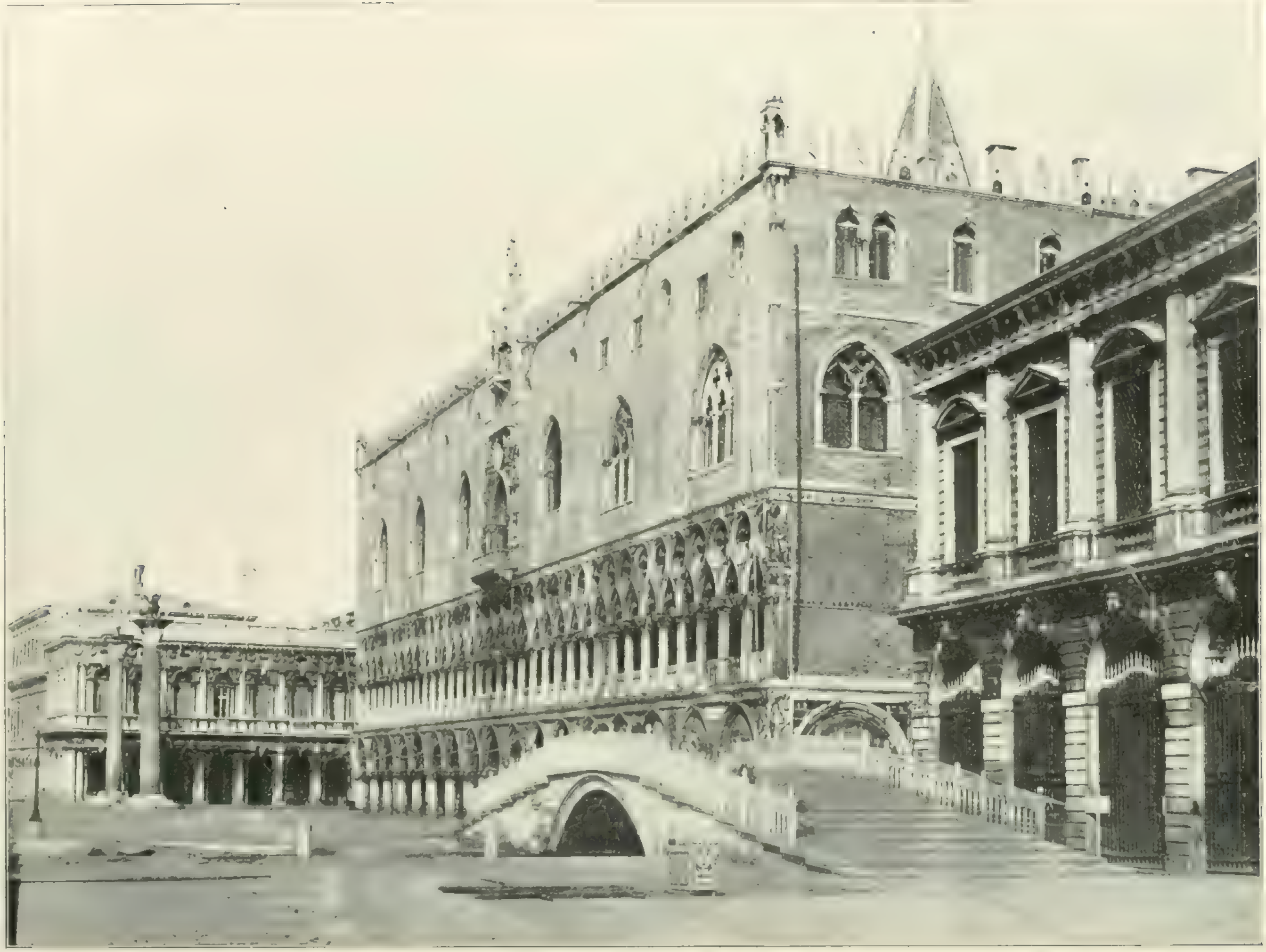
D. By extension, among European peoples, a smoking room, or a public house or room where smoking is the chief enjoyment. Generally furnished with divans in sense *C.* — D. N. B. S.

DIVIDERS. A pair of compasses having both legs terminating in points, for use in laying off given distances, or in dividing a given distance into a given number of equal parts; whence its name.

Bisecting Dividers. Dividers so adjusted that the distances between two pairs of points have a constant ratio of one half. (See next term.)

Proportional Dividers. Dividers whose legs extend in both directions from the pivot, giving two pairs of points. The pivot is movable along a graduated scale so that the distances between the respective pairs of points may be adjusted to any given ratio. Thus, if it is desired to copy a given drawing on a scale twice as great, the pivot is placed on the graduated scale so that

PLATE XXVI



DOGE'S PALACE

That of Venice; seen from the southeast, the front shown being that toward the Molo and the Canale di San Marco — the principal harbour of Venice. The building on the right is the Prison, which is connected with the palace by the Bridge of Sighs. The building on the extreme left is the Zecca, or Mint; the two-story building in front of it, the beautiful library of S. Mark. Of the two free columns the further one carries the statue of S. Theodore on his crocodile; the nearer one, the Lion of S. Mark — the latter an early mediaeval bronze with wings added more recently.

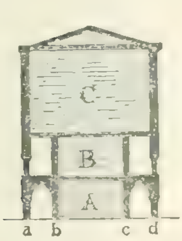
the distance spanned by one pair of points will always equal twice the amount subtended by the other pair. The scale is graduated mathematically for other proportions; and there is sometimes, also, a scale giving the ratios between the sides of regular polygons and the radii of their respective circumscribing circles, so that a given circumference may be readily divided into a desired number of equal parts.
—D. N. B. S.

DIVINITY HALL. In Scotland, the building or department of a university in which theology is taught.

DIWAN. A council chamber, court room, or hall of audience; the same word as Divan, but used in English chiefly in combination, and as denoting special and local Oriental apartments. Thus, diwan-i-khas and diwan-i-wam were, under the Mogul dynasty in India, the one an inner council chamber of the emperor himself, and the other the large general audience chamber where receptions were granted to crowds of people. In North Africa small diwans in private houses are sometimes circular, and covered by circular cupolas.

DOBIE. Same as Adobe, an American corruption.

DODECASTYLE. Having twelve columns in the front row; said of temples and buildings of classic type. The only known example in antiquity was the *Telestereion* at Eleusis; in modern architecture a conspicuous dodecastyle façade is that of the Chamber of Deputies, facing the *Pont de la Concorde* in Paris. (See Columnar Architecture.)



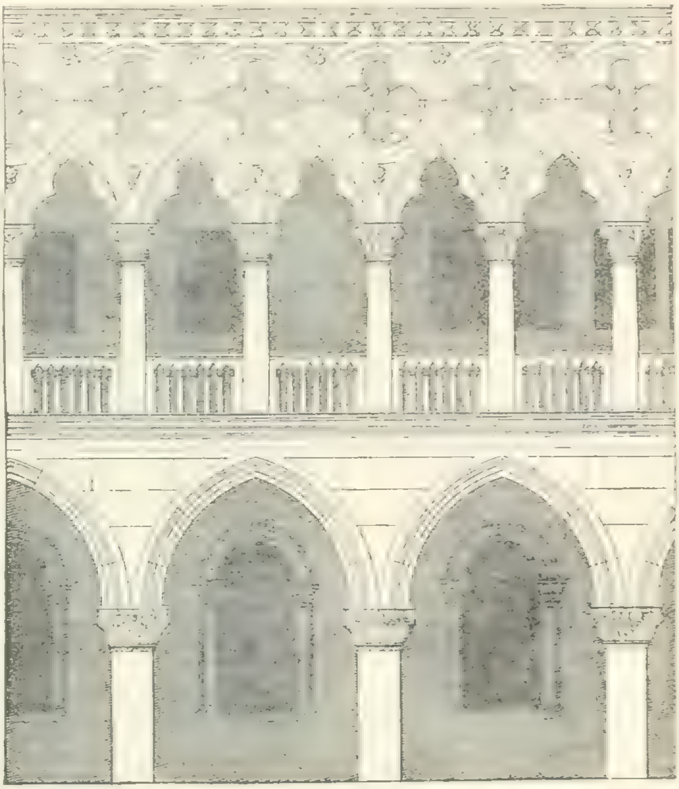
Doge's Palace of Venice: Section through the Southern Portion, fronting on the Riva dei Schiavoni.

A. Ground story, with minor offices [illegible] the open arcades *a b* and *c d*. *B.* Second story [illegible] others between open arcades. *C.* Great Hall [illegible] del Maggior Consiglio, [illegible] 82 feet [illegible] outer walls, 170 feet long, 51 feet high [illegible].

DOG. In general, any simple appliance, usually of metal, for securing parts or members together by means of one or more projecting teeth or bent portions, as a lug, a cramp. Usually in combination, as dogtie, dogiron. More specifically:—

A. A carpenter's instrument, used to force floor boards tightly together.

B. A firedog or Andiron.



Doge's Palace, Venice: Portion of Sea Front; see Section.

DOGANA. In Italian, a customhouse or office building for the collection of taxes on merchandise. In Venice the *Dogana di Mare*, or customhouse for merchandise arriving by sea, is a very interesting building, known to all travellers as filling the sharp angle between the *Canal Grande* and the *Canale della Giudecca*. It is a one-story building, erected toward the close of the seventeenth century.

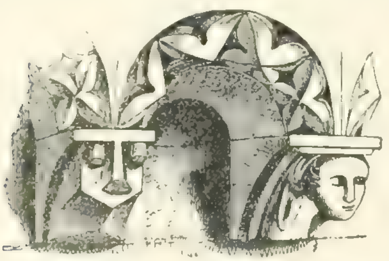
DOGE'S PALACE. The official residence of a sovereign prince called Doge, and of which only two have existed, namely, at Genoa and at Venice. The first, on the Piazza Nuova at Genoa, has been almost entirely rebuilt in modern buildings, but a great tower remains. The beautiful building at Venice is more often called the Ducal Palace. [illegible] the quay (the Molo) is Gothic of the fourteenth century, the western face on the Piazzetta was built at a later time in close imitation of the former. The eastern front on the narrow canal (Rio del Palazzo) is a remarkable and unique monument of the Renaissance, built toward the close of the fifteenth century. The three fronts on the court are of a curious transitional architecture. A magnificent late Gothic doorway called Porta della Carta leads from the Piazzetta to this great court, and opposite to this is the Giant's Staircase, a beautiful work of the Renaissance. Some of the halls and rooms of the palace are of peculiar importance, architecturally, or more often because of the paintings in them; such are the Sala del Maggior Consiglio, the S. dei Quatro Porte, the S. del Scrutinio, the S. dei Pregadi (or del Senato), the Chiesetta, or Chapel, and the Anti-Chiesetta, the Collegio, and the Anti-Collegio. — R. S.

DOG GRATE. A movable fire-grate, intended to be supported on dogs or andirons. — (C. D.)

DOG KENNEL. (See Kennel.)

DOG LEG; DOG LEGGED. (See under Stair.)

DOG TOOTH. A pyramidal sculptured ornament generally forming one of a series close together, resembling a row of teeth. The common form has a base, square or approximately square, and is formed by the points of four leaves radiating from a raised centre. This ornament is very common in English work, especially of the thirteenth century.



Dog-tooth Moulding, Ketton Church, Rutland.

DOKHMA. (See Tower of Silence.)

DOLCI, GIOVANNI (GIOVANNINO) DI PIETRO DEI, woodworker (*intarsiatore*); sculptor and civil and military architect; d. about 1486.

He first appears in the records of the reign of Nicholas V. (Pope 1447–1455), and was employed by Pius II. (Pope 1458–1464). Under Paul II. (Pope 1464–1471) he held the office of *soprastante delle fabbriche*, and worked at the Vatican and the Palazzo di S. Marco (Rome). Under Sixtus IV. (Pope 1471–1484) he built the Sistine chapel (Vatican, Rome), which is incorrectly attributed by Vasari to Baccio Pontelli. Two bulls of Sixtus IV., dated Nov. 14, 1481, are in existence, which confide to Giovannino the reconstruction of the citadel of Cività Vecchia. Oct. 17, 1482, he was created châtelain of that fortress. (See Pontelli.)

Muntz, *Renaissance*; Muntz, *Les Arts à la cour des Papes*.

DOLERITE. A coarsely crystalline form of basalt or diabase. — G. P. M.

DOLMEN. In Brittany, and elsewhere in France, a rough stone monument, prehistoric or of uncertain date; usually a flattish rock supported by smaller stones which partly surround the chamber of which the large stone forms the roof. (See Cromlech; Megalithic.)

DOLOMITE. A stone resembling limestone, but consisting of the mixed carbonates of lime and magnesia. — G. P. M.

DOM. *A.* In German, a cathedral church.

B. In German, same as Dome.

DOME (n.). *A.* A building; generally one of importance, and a public building rather than a dwelling: —

> "Here, hard by Vesta's temple,
> Build we a stately dome."
> — Macaulay.

In this sense used only in poetry or in a loose and general way. The use, in Italian, of the word *duomo*, and the corresponding German word *dom*, applied to a cathedral church, seems to have had no influence in England.

B. A cupola; more commonly used for a large one covering in a good part of a building. In this sense also it is loose and inaccurate, and it would be far better if the word cupola were used exclusively for a roof of this kind. (See Byzantine Architecture; India, Architecture of; Moslem Architecture; Neoclassic Architecture; Roman Imperial Architecture.)

Gothic Dome. A structure supposed to be possible or conceivable; at once a true cupola and Gothic in structure and design. A true cupola could not exist in Gothic architecture. When, however, a vaulted compartment is much crowned-up, the rounded forms approach those of a dome in this sense (see cut of the church of S. Maria d'Arbona under Italy, The Marches).

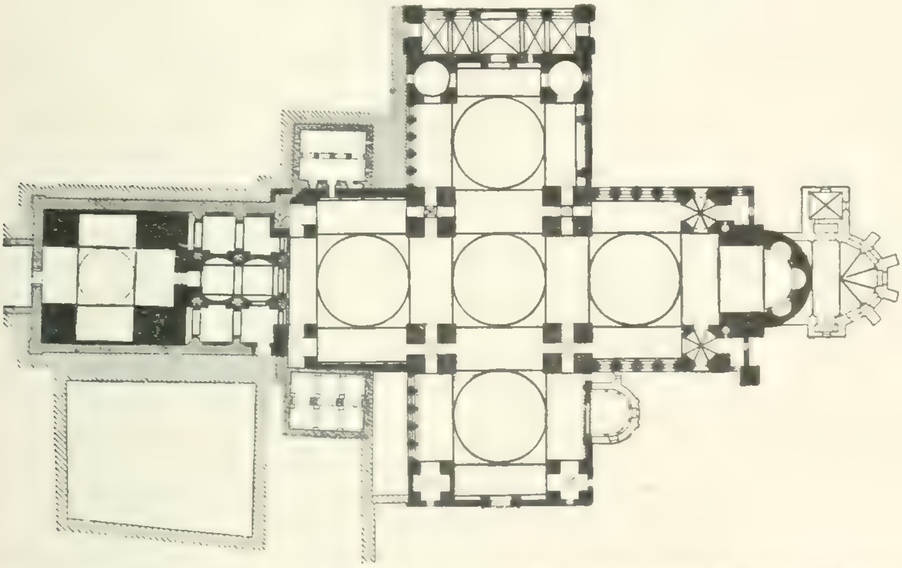
DOME (v.). To provide or roof with a dome or domes. To form like a dome.

DOME LIGHT. In American dwellings, especially in the city, the skylight above the principal staircase, and serving to light the hall and passages; so called because of the imitation dome in lath and plaster, which was commonly placed below the horizontal surface of glass, making a quasi architectural finish to the walling of the hall.

DOMENICHINO. (See Zampieri Domenico.)

DOMENICO (BERNABEI), DA CORTONA (called **BOCCADOR**); d. about 1549.

He derived his name from the city of Cortona in Italy. Mariette (op. cit.) gives Bernabei as the family name, and says that Domenico was a pupil of Giuliano di San Gallo (see San Gallo, Giuliano da). He was brought to France by Charles VIII., and in the accounts of that king is called *faiseur de chasteaulx et menuisier.* In the accounts (*dépenses secrètes*) of François I. there is an entry concerning payment to him for engineering work, bridges, mills, and the like, done at the châteaux of Tournai, Ardres, and Chambord. On this record has been based the erroneous assumption that he drew the original plans for the château of Chambord (see Nepveu). An inscription which formerly existed over the main portal of the old Hôtel de Ville in Paris, which was destroyed by the Commune, May 24, 1871, ended with the words *Domenico Cortonensi Architectante.* It has also been the accepted tradition since Sauval that Domenico designed the central portion of the façade of the old Hôtel de Ville. Modern criticism, however (Vachon, Palustre), gives him simply the position of consulting or associate architect (see Sebastiano Serlio and Fra Giocondo), and ascribes the authorship of the Hôtel de Ville to Pierre Chambiges (I.).



Domical: Church of S. Front, Périgueux (Dordogne), France; roofed with Five Cupolas

Bauchal, *Dictionnaire*; Vachon, *L'Ancien Hôtel de Ville*; Palustre, *La Renaissance en France*; Calliat-Leroux de Lincy, *Hôtel de Ville*; Chennevières, *Archives de l'art français*; Mariette, *Abecedario*; De la Saussaye, *Chambord*; Sauval, *Antiquités de la ville de Paris.*

DOMENICO DI BACCIO D'AGNOLO. (See Baglioni Domenico.)

DOME OF THE ROCK. (In Arabic, Kubbet Es-Sakhrah.) Same as Mosque of Omar.

DOMESTIC ARCHITECTURE. (See Apartment House; Casa; Château; Cottage; Flat; Hôtel; House; Palazzo; Tenement House; Villa.)

DOMICAL. Pertaining to, resembling, or characterized by, a dome; domed; as a domical pendentive, a domical vault, a domical church.

DOMINICAN ARCHITECTURE. (See Monastic Architecture.)

DONALDSON, PROFESSOR THOMAS LEVERTON; architect; b. Oct. 17, 1795; d. Aug. 1, 1885.

At the age of sixteen he entered his father's office, and in 1817 won the silver medal at the Royal Academy. In 1818 he began a tour in Italy and Greece, some of the results of which were published in the supplementary volume of Stuart and Revett's *Antiquities of Athens* in 1830. A list of his buildings is given by Gruning (op. cit.). For about ten years after 1835 he held the office of Chairman of the Commissioners of Sewers of Westminster and a part of Middlesex. He was professor of architecture and construction at University College, London. He was a member of the building committee of the exhibition of 1851, held numerous foreign honors, and was member of many societies. Professor Donaldson was a supporter of the *Arch. Pub. Soc. Dictionary*, and contributed much to the earlier volumes.

Gruning, *Memoir* in *Royal Inst. of British Architects. Transactions*, 1886.

DONATELLO (DONATO DI NICCOLÒ DI BETTO BARDI); sculptor; b. between 1382 and 1387 (Donatello did not know his own age precisely); d. Dec. 13, 1466.

Donatello was the son of a wool carder at Florence (Italy), and received his first training in the atelier of a goldsmith. He spent much time in Rome with Brunellesco (see Brunellesco) between 1403 and 1417. The work ascribed to the early part of his life is characterized by extreme realism, and includes the statue of Poggio, called "Zuccone," on the Campanile, the marble David at the *Museo Nazionale* (about 1416), the seated S. John the Evangelist at the cathedral of Florence, and the S. George of Or San Michele (Donatello's best work). From 1425 to the expulsion of the Medici in 1433 he was assisted by Michelozzo (see Michelozzo). They made together the tomb of the deposed Pope John XXIII at the baptistery (Florence), the Brancacci monument in Naples (finished about 1427), and the exterior pulpit of the cathedral of Prato, for which the contract was signed July 14, 1428. He finished the tomb of Giovanni de' Medici in the old sacristy of S. Lorenzo (Florence) about 1428. The singing gallery (Cantoria) now in the *Museo Nazionale* was made between 1433 and 1440. The medallions (copied from antique gems) in the spandrels of the court of the Riccardi palace (Florence) and the bronze doors of the old sacristy of S. Lorenzo belong to the same period. In 1444 he began the great equestrian statue of Erasmo Gattemelata at Padua (finished 1453), and the splendid series of statues and bas-reliefs in the church of S. Antonio in that city.

Müntz, *Donatello*; Hans Semper, *Donatello*; Schmarzow, *Donatello*; Tschudi, *Donatello e la critica moderna*.

DONJON. The strongest part of a strong castle of the European Middle Ages. It was usually a tower more or less completely separated from the other works and defences, but always capable of prolonged defence after the rest of the castle had been mastered by the assailants. The earlier donjons were usually round towers, but in the fourteenth century and later they were often square or of irregular outline. Originally, the apartments of the lord of the castle and his family were in the donjon, but this ceased when the desire became manifest for much more spacious and comfortable rooms, and when, at the same time, the entire circuit of the walls became an organized whole, capable of defence, every part in harmony with and assisting every other. From both these causes, the peculiar importance of the donjon disappears as early as 1350, although there still remains an exceptionally strong tower or group of towers which can be called by that name. (Called also Keep.)

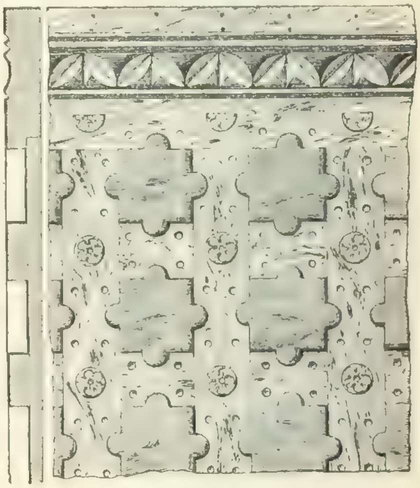
DONNER, GEORG RAPHAEL; sculptor and architect; b. May 25, 1693 (at Essling near Vienna); d. Feb. 15, 1741.

After the siege of Vienna in 1683 and the defeat of the Turks, there began an important period of architectural development in Austria which continued far into the eighteenth century. The sculptured decoration of these buildings is usually in the debased baroque style. The work of Raphael Donner is an exception, being characterized by great simplicity and refinement. Donner's baptismal name was Georg. The name Raphael was added later. He was educated in the convent of the *Heiligenkreutz* in the Wiener Wald, where he met his first teacher, the sculptor Giuliani. As early as 1724 he appears attached to the imperial court at Vienna. In 1725 he went to Salzburg (Austria) to execute the figures of the stairway of the archbishop's palace of Mirabell. About 1727 he went to Presburg in Hungary and was appointed director of the buildings undertaken by Esterhazy, Prince, primate of Hungary. Nov. 4, 1739, Donner completed his most important work, the great fountain in the *Neue Markt* (formerly *Mehlmarkt*) at Vienna. He made also the fountain of the *Rathhaus* at Vienna, with the bas-relief of Andromeda.

Falke, *Raphael Donner* in *L'Art*, Vol. V.

DOOK. A piece of wood, as a plug or block, inserted into a masonry wall to provide a place for nailing.

DOOR. The filling, usually solid, of a doorway, so secured as to be easily opened and shut. It is much more common to support a door by hinges secured to the doorpost or frame at the side; but a door may turn on pivots at top and bottom, as frequently in antiquity, or may slide or roll up horizontally or vertically. Where the solid filling is hung by hinges at the top of the doorway, or where it slides vertically, in the manner of a portcullis, it is rarely called a door. (For the more usual manner of hanging doors, see Hinge). The doors of antiquity are but little known to us; a few of bronze, belonging to the later years of the Roman Empire, still exist, and it may be said that modern doors of metal have been



DOOR OF S. ANASTASIA, VERONA; DECORATIVE FRAMING IN WOOD.

studied from the ancient examples. The doors of the Middle Ages were usually of solid planks set edge to edge, and secured to each other by dowels or bands; the whole being held in place by the long strap hinges having holes through which nails were driven through the wood and clinched on the other side. Panel doors are not very ancient, but their obvious superiority in lightness, in permanent retention of their plane surfaces, and in counteracting almost entirely the shrinkage of wood, has made their use almost universal. Doors have always been a favourite medium for rich ornamentation.

— D. N. B. S.

Batten Door. One in which the body of the door is made of boards or planks having battens nailed across them to keep all in place; common in very rough work, barracks, sheds, outbuildings, etc. (Compare what is said under Cleat.)

Blind Door. In the United States, a door having the character of, and serving as, a blind; *i.e.* having fixed or movable slats. (See Blind, *A*.)

Cellar Door. Any door, especially an outside door, leading to a cellar; more specifically, one set on a considerable slope with the vertical and often approaching more nearly to the horizontal; in use at the head of stairs leading to a cellar from outside the house. Low walls are carried up on either side of the stairway, and these slope from nothing, at the landing of the stairs, to a sufficient height above to correspond with the opening in the house wall, which itself must be high enough to allow head room.

Crapaudine Door. A door turning upon a pivot at top and bottom, the pivots being let into sockets in the lintel and threshold.

Double Door. One which is divided into two folds, one of them being hung on each side of a doorway, the two folds, or valves, meeting in or near the middle, and closing the opening; commonly known as a Folding Door.

Double Framed Door. One in which there is an outside framed structure complete with stiles and rails which encloses and holds a secondary framed structure of stiles, rails, and panels, the latter forming, as it were, a panel to the outside frame.

Double Margin Door. A door made to appear as though consisting of two leaves, as in imitation of a folding door. It has a stile at the centre twice as wide as the side stiles, and centre beaded, or otherwise finished to resemble two stiles, therefore showing a double margin.

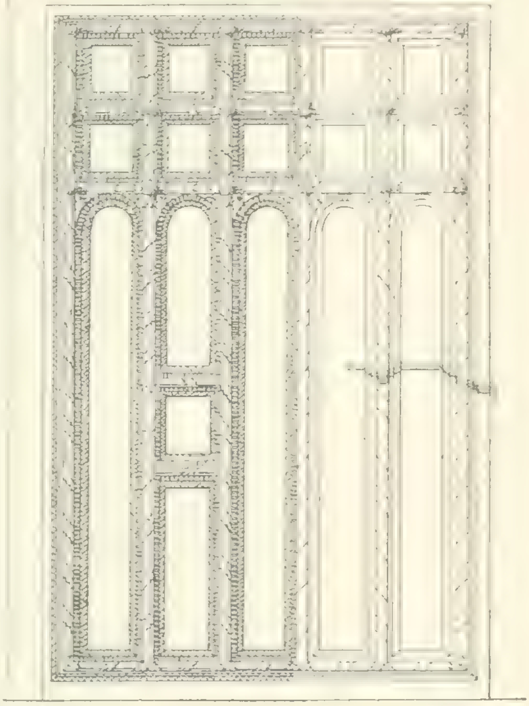
Dutch Door. In the United States, a door divided horizontally into two pieces, so that the lower half can be kept shut and prevent the ingress of fowls and small animals and the passage of children, while the upper half remains open for the admission of air.

Falling Door. Same as Flap Door, *B*, below. — (C. D.)

Flap Door. *A.* A door placed horizontally or on an incline, and opening up, as is common, over steps leading to a cellar from the street.

B. A small door or shutter in a vertical opening, but hinged at the bottom so as to open downwards. — (C. D.) (Compare Trap Door, below.)

Folding Door. A door divided into two or more folds, or valves, which are hinged to the frame or to one another. A few doors exist in which each half is again halved, much on the principle of the folding inside shutters of a window. Of similar character are the doors arranged in schoolhouses, church lecture rooms, and the like, which, by means of a series of valves hinged one to another, may divide a large room as if by a partition, and open it up again into one room by folding against the wall the valves forming the partition. Something similar is to be found in connection with certain park gates which are closed by night and opened by day. In such cases, it is essential that the valves should be supported by means of little wheels running on arcs of metal set in the floor or the road. The above are properly folding doors, or gates; the word is extended also to Double Doors.



Door of Carved Wood, Venice, from a Palazzo of about 1550

Half Door. *A.* Properly, one half of a Dutch Door; the term is also applied to the

Dutch door complete, as when it is said that the outer doorways of a frame house are hung with half doors.

B. In the United States, a door less in height than the doorway, so as to leave a considerable opening above and below.

Holy Doors. In Greek ecclesiology, the doors of the Iconostasis.

Jib Door. A door so hinged as to be flush with the wall on either side, and to be, if carefully adjusted, almost indistinguishable when shut. The object of it is usually not secrecy, but the preservation of perfect symmetry in a room where other doors correspond each to each, and no such feature is desired at the place where the jib door is put.

Ledged Door. One constructed with the use of ledges, as in a Batten Door.

Overhung Door. One hinged at the top and swinging upward, requiring to be held open by a hook.

Revolving Door. A weather door recently (1900) devised in the United States, which, when in operation, consists of four equal flaps hung at right angles to a pivot at the axis of a cylindrical structure within which the doors revolve. The outer edges of the doors are finished with rubber strips maintaining close contact with the inside face of the cylindrical shell, which is pierced with two opposite doorways so disposed that the direct passage between them is at all times closed by the doors, in whatever position. Pedestrians pass by pushing any one flap, as in a turnstile. When not in operation, the doors may be folded together so as to allow of direct passage at either side, or bolted across the passage for security.

Rolling Door. A rolling shutter applied to a doorway. (See Shutter.)

Door in the Façade of the Church of S. Gervais, Paris, c. 1680.

Royal Door; Doors. In Greek ecclesiology, those leading from the narthex into the church; sometimes the central door of three or five similarly placed.

Sash Door. One of which the upper half, or thereabouts, is constructed as a sash to hold glass; generally as one piece, but sometimes having a movable sash.

Sham Door. A door finished only on one side, and set in a wall or partition to appear like a practicable door.

Sliding Door. A door arranged so as to slide sidewise. In stables, freight houses, etc., it slides in the open against the back face of the wall; in dwelling houses it slides into a pocket in the wall or partition. It may be either single or double.

Swing Door. One which has no striking piece, and swings past the door post at the side opposite the hinges. Such doors are commonly hung with double action spring hinges; but it is easy to arrange one with two pairs of single action hinges by using a strip of wood as thick as the door, hinged to the doorpost on one side and to the door on the other, the hinges being naturally turned in the opposite ways.

Storm Door. Same as Weather Door.

Trap Door. One fitted to an opening in a horizontal, or nearly horizontal, surface, as a floor or roof, the essential fact being that a person ascends head first through it and descends feet first. The cellar door, as described above, is a variety of trap door.

Venetian Door. A doorway divided into three parts by two mullions, or shafts, the central and wider part being occupied by the door, and the narrow side openings being windows. The central opening generally has a glazed arch over the door.

Weather Door; Doors. A door or pair of doors planned to shut quickly behind persons passing through the outer doors of a lobby, and so to prevent much ingress of cold air; these are commonly extra doors fixed outside of the usual entrance in cold weather, and the term is often used to include the light and sometimes temporary vestibule or porch which includes the door. (Compare Wind Porch.)

Wicket Door. (See Wicket.) — D. N. B. S.

DOOR BAND. *A.* A bar or large bolt used to fasten a door.

B. A strap hinge or strip hinge, especially in doors made of plank set edge to edge, and in which the principal means of securing the planks in their place is by the hinges themselves.

DOORBELL. *A.* A contrivance for notifying persons within a house or apartment that some one seeks admission; formerly, a bell hung on a spring, and set ringing by pulling a wire which was pulled by a knob or lever outside, the fashion of which changed greatly during the early years of the nineteenth century (see Bell Hanging); afterward, usually a gong struck by a lever which was pulled by a wire as above stated. More lately, very often an electric fitting. (See Electrical Appliances.)

B. A bell attached to a door, which cannot be opened without ringing the bell; used as a signal, as in a small shop. — R. S.

DOOR CHECK. A mechanical contrivance for automatically closing a door; the power being supplied by a spring whose action is checked gradually by a pneumatic piston or similar contrivance, causing the door to close gently.

DOORNAIL. A nail made of soft iron so as to be easily clinched, and having a large head; such as were used in those mediæval doors which were made of strips of plank held together mainly by cleats or battens, or by the straps of the hinges, the nails passing through from side to side, and holding the parts together.

DOORPLATE. A metallic plate fastened upon a door, bearing the name of the occupant of the house. The custom of using these, once almost universal in many towns, has been abandoned, partly because of the facility which it gave to dishonest beggars. The name was often engraved on a silver plated circle surrounding the bell pull.

DOOR SPRING. An appliance made with a spring or springs to hold a door in a given situation; generally fast shut. (See Door Check.)

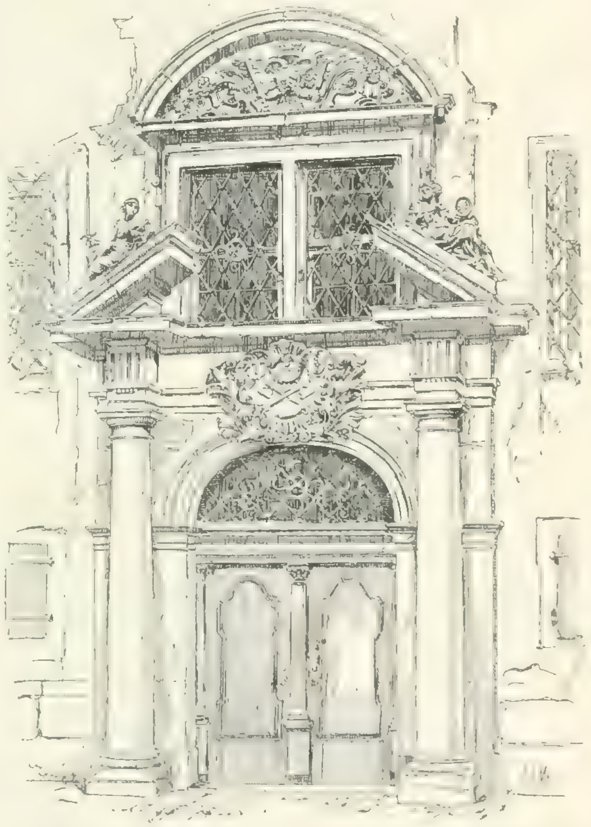
DOORSTEAD. The structure forming a doorway; a doorway together with the surrounding parts.

DOORSTEP. *A.* The sill of a doorway; that upon which one steps in passing from a lower level through the doorway.

B. By extension, the platform with two or three steps outside of an outer door. (Compare Porch; Stoop.)

DOORSTONE. A stone serving as a doorstep in sense *A.*

DOORSTOP. *A.* A knob or block screwed to the floor or to the base of an adjoining wall, to prevent the door from swinging back too far; it is usually provided with a rubber ring or buffer.



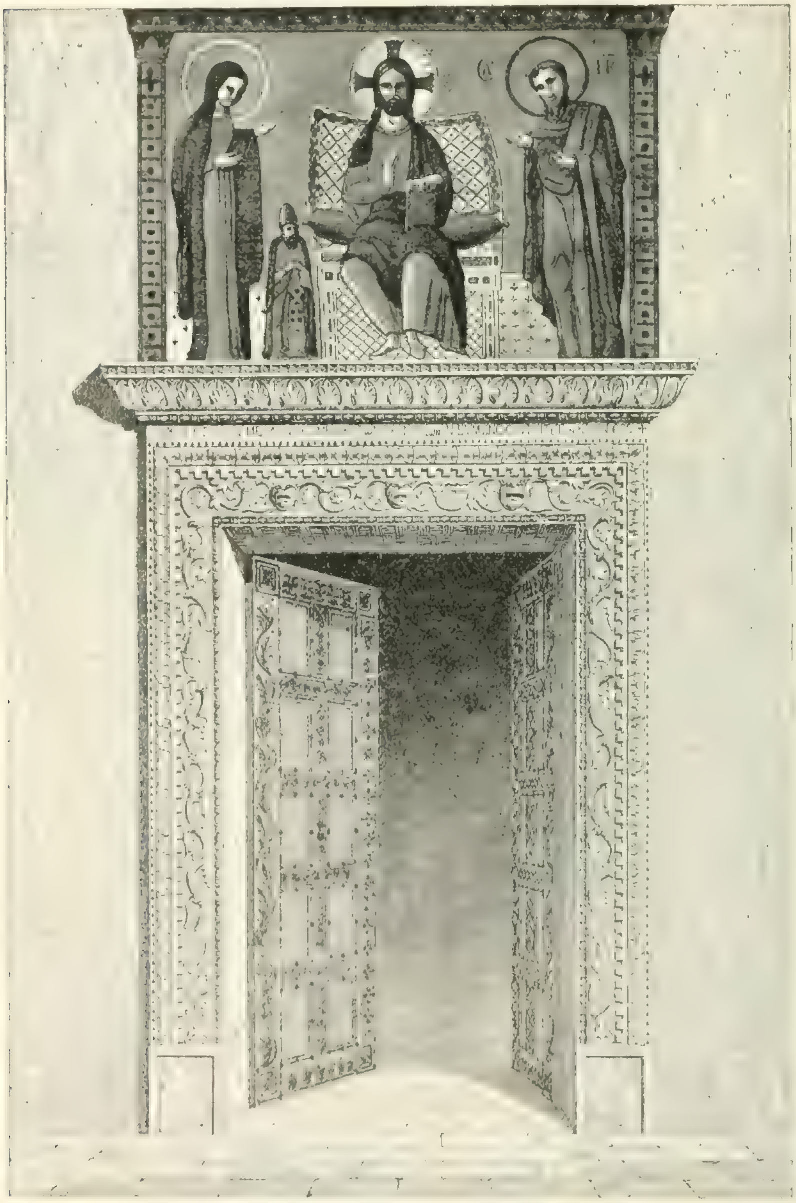
Doorway, the Rathhaus, Ratisbon (Regensburg), Bavaria, c. 1662 A.D.

B. A mechanical device for stopping or holding an open door; some of these devices holding it at one point only, others being attached to the door, and checking it at any point. (See also Step; Stop Bead.)

DOOR TREE. (See Tree.)

DOORWAY. An opening for entrance to, and exit from, a building or part of a building; such an opening, together with its immediate surroundings. (Compare Doorstead.)

Notched Doorway. A doorway narrow at the bottom for about one third of the total height, and then notched back, to about double its starting width, on one or on both sides. It is found in the modern Pueblo Indian villages of Arizona, and in Cliff Dwellings and other ruins of the Southwest. In the Cavate Lodge construction of the Verde region in Arizona, another form occurs, as of a pear with the small end down, instead of rectangular. Doorways of this kind were adapted to Indian life, where burdens were carried on the back, making width at the bottom unnecessary; enough for the free movement of the legs being sufficient. As these openings were closed by blankets or mats, the narrow bottom part was an advantage in keeping out the winter air. (See Cavate Lodge, under Lodge; Communal Dwelling.) (Cuts, cols. 813, 814; 815, 816.) — F. S. D.



DOORWAY, CHURCH AT GROTTA-FERRATA (LATIUM), ITALY.

The carved marble doorpiece is of unknown early date; the mosaic above is of the 12th century.

DOORWAY PLANE. A splayed jamb and corresponding intrados of an arched doorway.

D'ORBAIS. (See Orbais, Jean d'.)

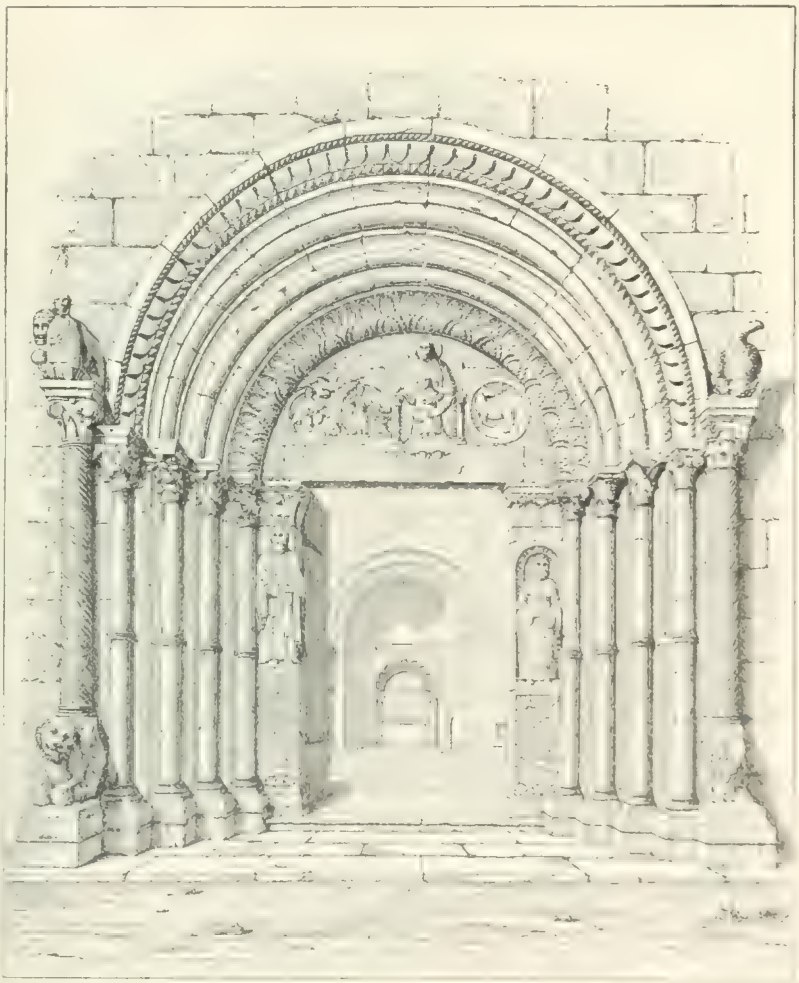
DORCHESTER STONE. An olive gray carboniferous sandstone, from Shepody Mountain, New Brunswick.
— G. P. M.

DORIC ORDER. *A.* One of the five orders recognized by the Italian writers of the sixteenth century, to whom, however, Greek architecture was almost wholly unknown.

B. The style of architecture used in the greater number of Greek temples known to us, and of which the Parthenon serves as the type.

Although the temples of Pæstum and Sicily were within the reach of the students and builders of the Renaissance, there is no evidence that they distinguished between the Greek type and the Roman modification of it. Considered, then, as one of the "five orders," the Doric is somewhat rare in Roman work. The earliest example of it known to us is the temple at Cori, the ancient Cora, near Velletri, in Italy. This building is thought to be of the time of Sulla. The column has a very small base, consisting of a single torus or large convex moulding, with a narrow fillet above it. The shaft is fluted with very narrow fillets between the flutes, and for two thirds of its height, the lowermost one third being simply brought to a polygon. The capital has annulets and above these a very slightly convex curve ending in a fillet which interposes between the curve and the abacus. This example is unique, and no other piece of Roman work known to us has at all its general character; it is probable that its peculiar forms are derived from the later architecture of Greece, though it is impossible now to point to any building which served as its model.

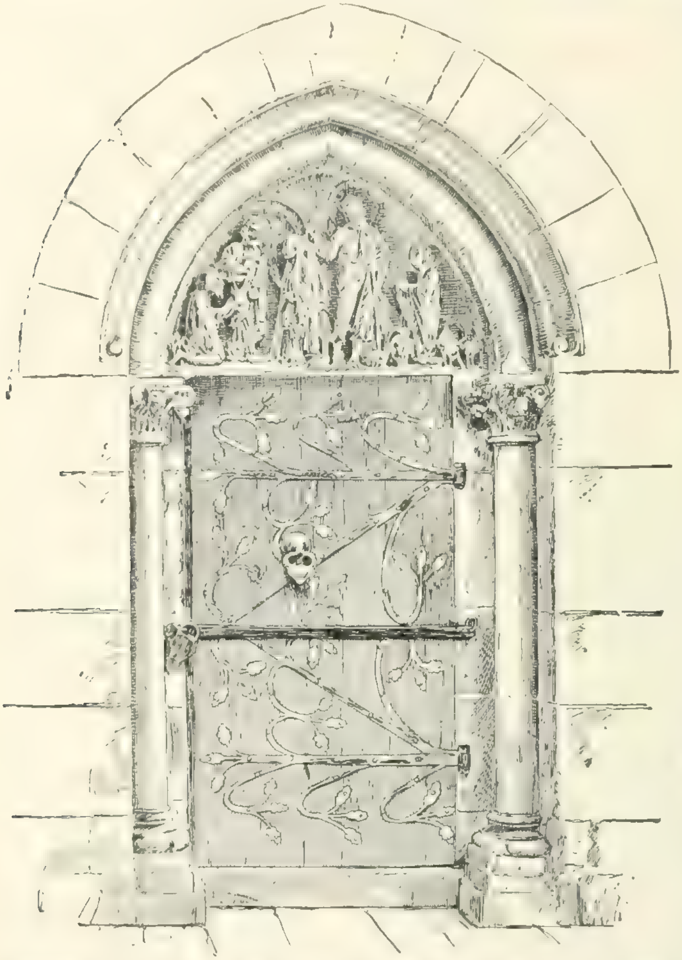
In Roman practice, the order is conditional, tending toward the Tuscan on one side and on the other toward a more elaborate form in which the capital is made up of several members, having especially a broad cylindrical continuation of the shaft interposed between the mouldings of the necking and those of the capital proper, beneath the abacus. Thus, the Doric of the theatre of Marcellus, built in the reign of Augustus, has a quarter round instead of an echinus or other flat convex curve; beneath this three or four fillets and beneath this again the cylindrical band which is adorned with rosettes. It has always been supposed that this order was without a base, but recent explorations have brought base mouldings to light. The Doric of the ground story of the Coliseum is not very unlike that of the theatre of Marcellus, but the shaft is not fluted; it has a well-marked base of several members. A still more elaborately modified fashion of capital exists in a ruin at Albano. In this the quarter round of the capital is carved into an egg and dart moulding, and the small cavetto which forms part of the abacus is also sculptured with conventional leaf forms. There is, moreover, a large rosette in each metope. The Italian architects and writers of the classical revival, in adopting this much enriched form of the order, were probably more influenced by the Column of Trajan than by the small and little-known fragment of Albano. It is noticeable that in both these cases the shaft is smooth and plain. The Doric order, then, as given by Vignola, is almost entirely a modern composition. The order was but little used among the Romans in a form rich enough to distinguish it certainly from the so-called Tuscan.



Doorway: S. Maria at Toscanella (Latium), Italy. Early Italian Romanesque.

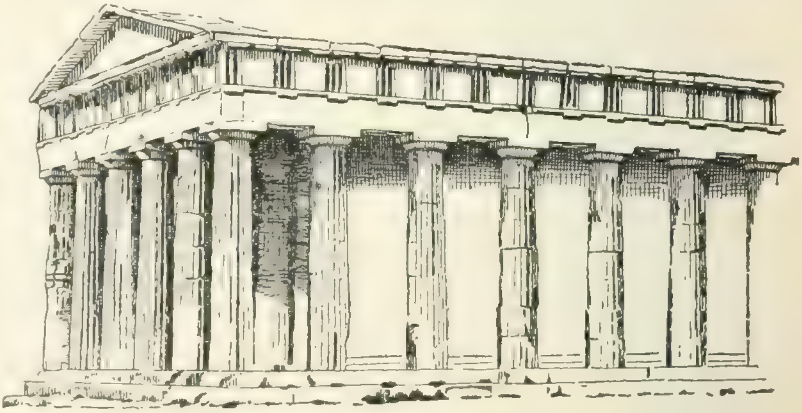
When the monuments of Athens were brought to the notice of European students, toward the close of the eighteenth century, it was seen at once that the order of the Parthenon and of the so-called temple of Theseus, of the temple at

Ægina and that at Sunium, were all of a type which must have been the original of the Roman Doric as described above. While, however, with the Romans the style was rare and continually passed into the almost naked crudity of the Tuscan, the Doric of the Grecian buildings was found to be the prevalent style throughout all the Greek lands of the Mediterranean. The distinction between the capitals, the entablatures, and the shafts of Athens, Pæstum, Segeste, Akragas, Metapontum, Thorikos, Ægina, and others which have been from time to time brought to the notice of scholars, although differing among themselves, are of a character which marks them unmistakably as the favourite mode of decoration of buildings among the Greeks from the sixth century B.C. to the time, at least, of the Alexandrian conquests. In these Greek examples, the column is fluted with channels separated by arrises and without fillets, and there are usually twenty such channels, there is no base whatever; the capital is a ring whose section is a peculiar curve supposed to be taken from the sea egg and therefore called echinus, struck by hand, and evidently a matter of great and curious interest to the Greek build-



Doorway: Cathedral of Magdeburg, Western Prussia; c. 1220.

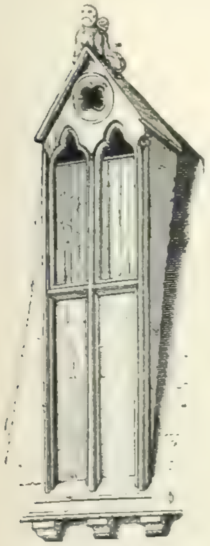
Doorway of Coombe Church, Oxon; 14th Century.



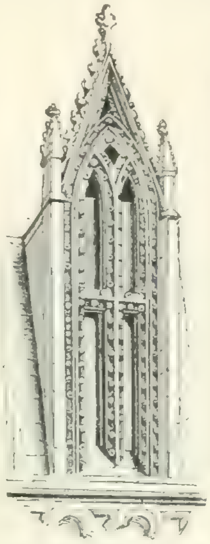
Doric Temple of Theseus at Athens.

(For plan, see Columnar Architecture.)

ers, and this member is separated from the shaft by annulets and a gorgerin, while the abacus which rests upon it is a square die without mouldings or modifications of any sort. This, then, is the style which should especially have been called Doric, but the term was generally applied to the Roman example, and we are driven to the awkward expedient of discriminating between Grecian Doric and Roman Doric.



Dormer Window, in the Spire, Witney, Oxfordshire; c. 1240. Early English.



Dormer Window of the Decorated Style; S. Mary's, Oxford, c. 1300.

(See bibliography under Grecian and Roman Imperial; see also that under Order.) — R. S.

DORMAN. In Great Britain, a large horizontal timber; a large beam; a sleeper; called also dormant and dormant tree; also Summer Tree (which see).

DORMANT WINDOW. Same as Dormer Window.

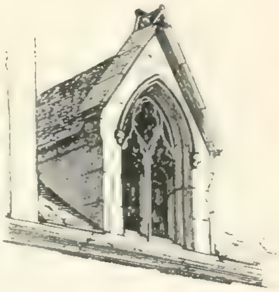
DORMER. *A.* A sleeping room; a dormitory.

B. Same as Dormer Window.

C. Same as Dorman.

DORMER WINDOW. Originally a window of a dormer, *A.* In modern times a window in the vertical face of a relatively small structure projecting from a sloping roof. The vertical face may be a continuation of the wall carried up above the eaves. In common speech the term is applied to the whole structure, including the vertical side walls, which are usually triangular in shape, and the roof, which may be gabled, hipped, or of penthouse form. Cf. a similar use of the term Bay Window. (Cuts, cols. 815, 816; 817, 818.) — R. S.

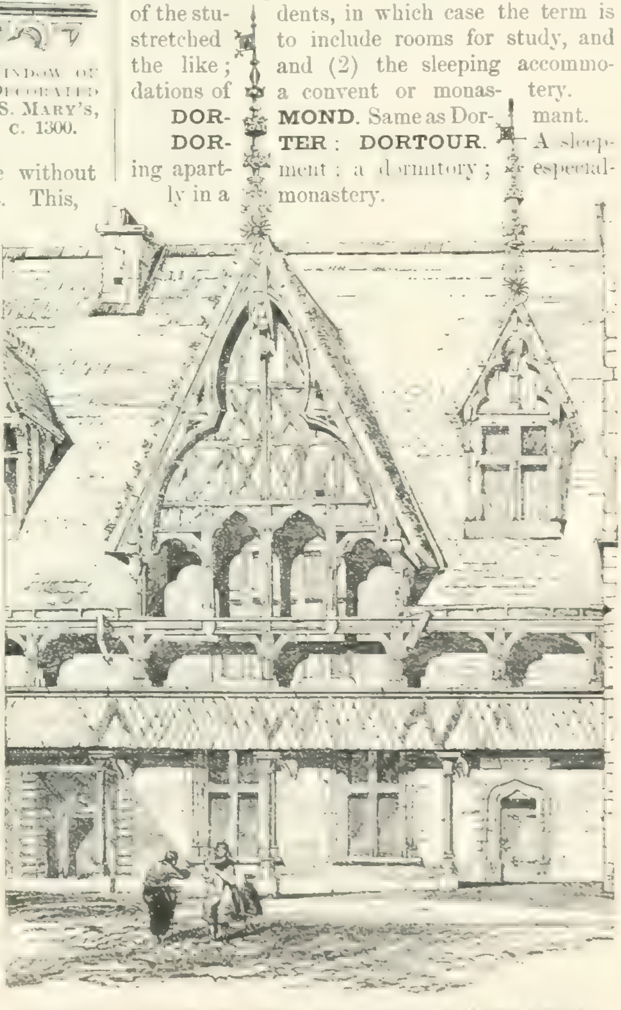
DORMITORY. A room or set of rooms intended for sleeping accommodation; hence, a building in which such rooms exist. The term is used chiefly for accommodations for many sleepers at once, either in a single unbroken interior, or in small closets or rooms arranged under a common roof. It is applied especially in one of two ways: (1) to a building connected with a college and intended for the lodging of the students, in which case the term is stretched to include rooms for study, and the like; and (2) the sleeping accommodations of a convent or monastery.



Dormer Window of Chapel Cleeve, Somerset; c. 1350.

DORMOND. Same as Dormant.

DORTER: DORTOUR. A sleeping apartment; a dormitory; especially in a monastery.



Dormer in Court of Hôtel Dieu, Beaune (Côte d'Or), France; 1443.

Dormer Window, House of Jacques Cœur, Bourges; 1443.

DOSIO, GIOVAN' ANTONIO; architect and sculptor; b. 1533; d. after 1609.

Dosio began as a goldsmith in Rome, where he spent three years in the atelier of Raffaello da Montelupo (see Montelupo). He was employed by Pius IV. (Pope 1559–1565) to restore antique marbles at the Belvedere. Returning to Florence about 1574, his first work was the Capella Gaddi in the church of S. Maria Novella. He built also the Giacomini-Laderel palace (begun 1580), the residence of the Florentine Bishop Alessandro de' Medici (begun 1582), and the Capella Niccolini (begun 1585) in the church of S. Croce. In the competition of 1586 he made a design for the façade of the Duomo, Florence.

Geymüller-Stegmann, *Renaissance in Toscana*; Borghini. *Il Riposo*; Muntz. *Renaissance.*

DOSSERET (I.). A member resting upon the sculptured bell of a capital and forming a second capital or an abacus of unusual thickness. It is generally plain or very slightly sculptured. Cf. Double Capital under Capital.

DOSSERET (II.). In French usage, a relatively small projecting portion of a jamb, forming a pilaster-like member, for the support of a lintel, or the like.

DOTZINGER, JOST (JODOQUE, JODOCUS); architect; d. 1472.

After the death of Hans Hultz (see Hultz), in 1449, Dotzinger succeeded him as supervising architect of the cathedral of Strassburg (Elsass, Germany). The cathedral was practically finished at this time. His most important work is the baptismal font now in the northern wing of the transept. In 1455 he undertook the restoration of the choir. Dotzinger was especially connected with the reorganization and consolidation of the masonic corporations of Germany. Before his time the architects and stonecutters had formed isolated lodges (*Bauhütte*) which had originated in the Benedictine monasteries and were secularized at the same time as the art of architecture itself. April 25, 1459, he called together a general convention at Ratisbon (Regensburg, Bavaria), which consolidated the scattered lodges in one order and established statutes and regulations for its government. Nicholas Dotzinger, probably a son of Jost, was also an architect and attended the convention at Regensburg.

Gérard, *Artistes de l'Alsace*; Grandidier, *Essais sur l'église cathédrale de Strasburg*; Architekten und Ingénieur-Verein, *Strassburg und seine Bauten*; Heideloff, *Bauhütte des Mittelalters in Deutschland*.

DOTZINGER, NICHOLAS. (See Dotzinger, Jost.)

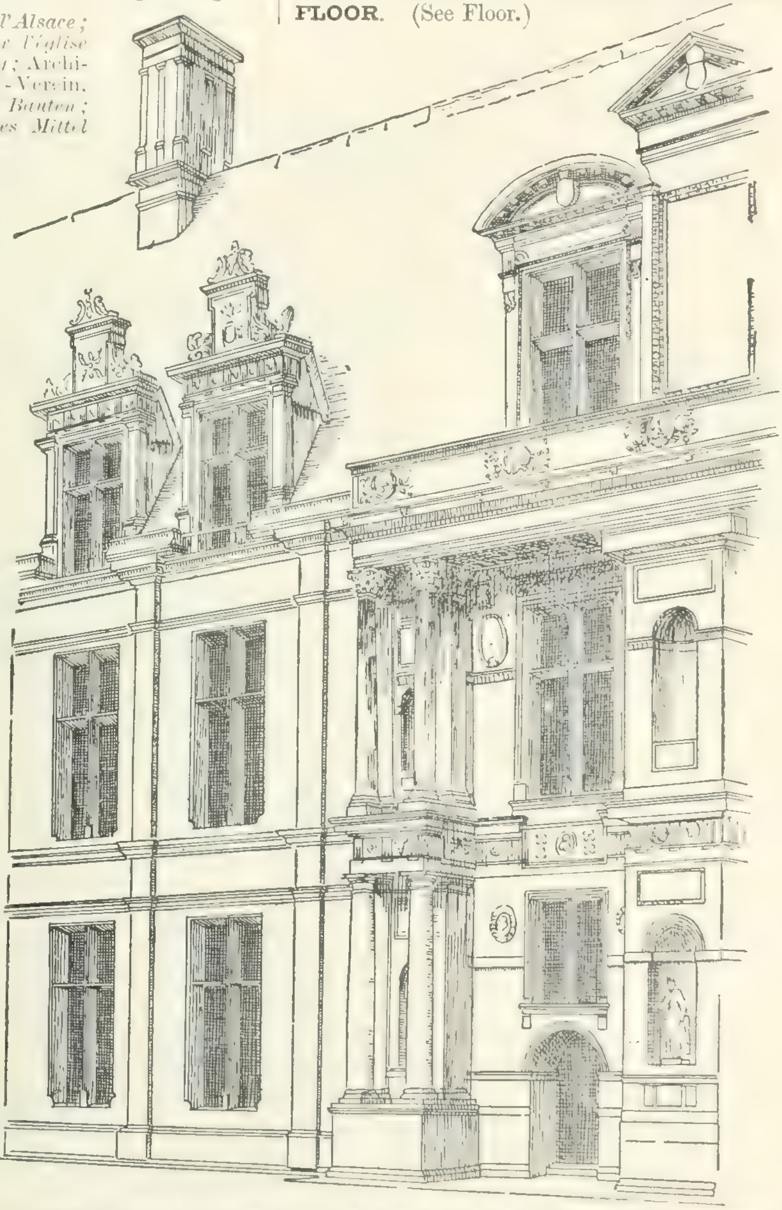
DOUBLE. (See Slate.)

DOUBLE CHAPEL. A chapel arranged as described under Double Church.

DOUBLE CHURCH. A church constructed in two stories, affording two places of worship one above the other. Also, one of two stories, and having an opening in the upper floor through which worshippers on one level are enabled to hear the service conducted above or below. Such a building sometimes formed the chapel of a feudal residence, one story being reserved for the lord and his family. The former arrangement is to be seen in the chapel of the archiepiscopal palace at Reims, a fine building of the thirteenth century; in the Sainte Chapelle at Paris of the same epoch; and in S. Francesco at Assisi. Of the latter sort are the chapel of the castle of Landsberg, Saxony, and the subject of the accompanying illustrations. (Cuts, cols. 819, 820; 821, 822.)

DOUBLE CONE. An ornament shaped like two cones whose bases coincide, and generally forming one of a series connected by their apices. This form approximates to what is known as spindle-shaped or fusiform; it is generally used in series to give a dentil-like effect of contrasting lights and shadows.

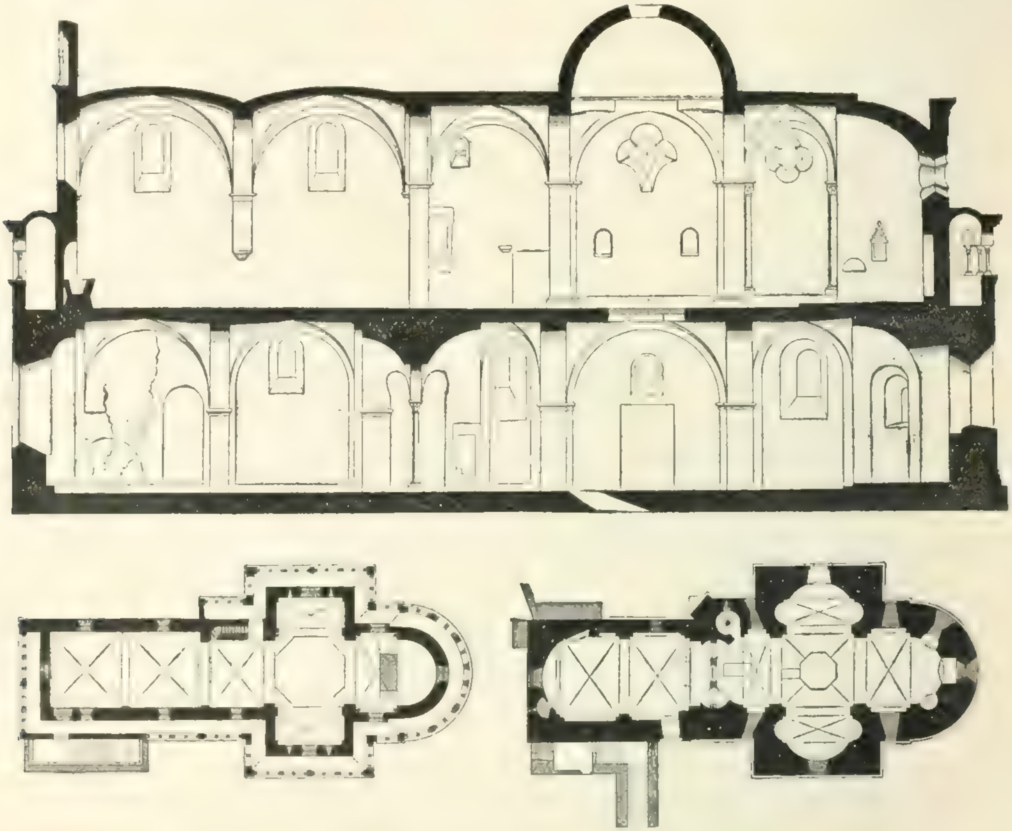
DOUBLE FLOOR; DOUBLE FRAMED FLOOR. (See Floor.)



Dormer Windows determining the Character of a Design. Courtyard Front, Chateau of Ecouen (Seine-et-Oise), begun 154[illegible]

DOUBLE HUNG. 1. Furnished with, or made up of, two sashes one above the other, arranged to slide vertically past each other; said of a window. Old houses, both in America and in England, often have only one of the two sashes hung with weights; the other being fixed, or, if movable, held in place by means of a button or prop; such may be said to be single hung.

B. Hung on both sides with cord and pulley; said only of vertical sliding sash. In some cases, where windows are narrow, or are divided by mullions into narrow lights, a window box with cord, pulley, and weight is furnished on one side only, the other side of the sash being sometimes fitted with rollers to facilitate its movement. Such sash may be said to be single hung. (See Sash; Window; Box Frame, under Frame.) — R. S.


Double Church, Schwarzrheindorf.

DOUBLE MEASURE. (See Single Measure.)

DOUBLING. *A.* A double course of slate, shingles, or tiles at the eaves of a roof made by two layers.

B. In Scotland, an eaves board.

DOUCHE. A bath in which the water is directed in a jet or stream, more or less divided, upon parts of the body. There are many kinds of douches, such as cold douches, tepid douches, alternating hot and cold douches (Scotch douches), etc. (See Bath; Bath House.)
— W. P. G.

DOUCINE. In French usage, same as Cyma Recta. (See Cyma.)

DOVECOTE. A house or box for pigeons, divided into compartments. The term is generally confined to the small structures such as are raised upon the roof of a barn, or the like. (See Colombier.)

DOVETAIL (n.). Any piece or member having two flaring sides or edges, giving more or less a wedge shape, similar to that of the spread tail of a pigeon; especially a member, tenon, tongue, or the like, having such a form, and intended to fit a corresponding mortise or recess. This form of framing is especially adapted to unite parts subject to a tensile strain, the tongue being made to flare in the direction opposite to the applied force; as to unite the front and sides of a box or drawer to prevent their separation under the influence of a pull applied to the front.

In masonry, the device is limited to cut stone as used in some elaborate constructions, such as fortress walls or sea walls. The celebrated Eddystone Lighthouse of 1759 had the lower part of the tower solid, and built wholly of joggled and dovetailed stones. — D. N. B. S.

Lap Dovetail. A dovetail for joining two boards, — as at a corner, — in which part of the thickness of one board overlaps the end of the other. Thus, the dovetail of the overlapping board is formed, as it were, in the angle of a rebate which receives the end of the other board. It is frequently formed as a Secret Dovetail (which see).

Secret Dovetail. One cut only part through the material so as not to show on the face.

DOVETAIL (v.). To cut into the form of a dovetail or dovetails; to unite by means of dovetails and corresponding recesses, or the like. Hence, to unite, as at the corners of a box, or the like, by means of any similar series of tongues and slots, whether shaped like dovetails or not. (Cuts, cols. 823, 824.)

DOWEL. *A.* A pin, or similar projecting member, to connect two parts together. It may be formed on one of the two parts to be united and fitted to an aperture in the other; or, more commonly, a separate member, as a short rod, or the like, inserted part way into each piece.

B. By extension from the preceding; same as Dook.

DOWEL (v.). To secure or fasten together by means of one or more dowels.

DOWEL PIN (n.). Same as dowel, *A.*

DOWER HOUSE. In England, a dwelling forming part of the dower given legally, or by previous arrangement, to a widow. (Compare Jointure House, which, however, is not to be taken as identical.)

DOYAC, JEAN DE; architect.

Doyac was *maître des œuvres du roi et expert juré de la ville de Paris.* Feb. 21, 1500, he undertook, with Colin de la Chesnaye, architect of the city of Rouen, the reconstruction of the *Pont Notre Dame* (Paris).

Leroux de Lincy, *Pont Notre Dame.*

DRAFT (n.). A narrow dressed border or margin along the edges of the face of a squared stone, generally of the width of the chisel edge, and approximating a true plane surface. It may be either a guide or gauge for subsequently dressing the remainder of the face to the same level, or remain as a border surrounding the rough central portion.

DRAFT (v.). *A.* To cut or dress a draft.

B. To draw, as a plan or design.

DRAFTING. (See Drawing.)

DRAFTING ROOM. A room reserved for drafting; that is to say, for the making of mechanical drawings, as by an engineer or his employees, an architect, a machinist, or the like. The primary requisite of such a room is light, and it is generally thought essential that this light should come from windows in the walls, not too high up. Light from skylights may be utilized if the well or shaft of the skylight be not too deep or high, so that drafting tables may be set at some distance from it horizontally without ceasing to receive the light. In north latitude, north light is better because more uniform; but a room should have some window through which the sun may enter.

— R. S.

Double Church, Schwarzrheindorf

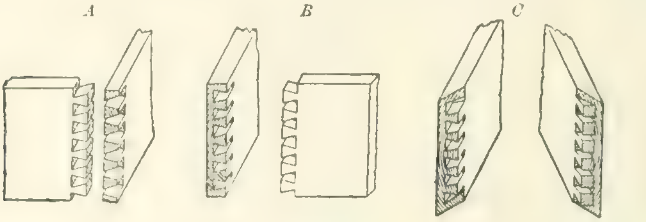
DRAFTSMAN. One more or less skilled in drafting; specifically, one whose business it is to draw and prepare plans and designs, as for an architect. Also written Draughtsman.

DRAFTSMANSHIP. Art or skill in drafting, or of a draftsman. Also written Draughtsmanship.

DRAG (n.). An instrument used in dressing stone. It consists of a plate of steel with a sawlike or finely serrated edge, which is dragged to and fro across the stone in a direction at right angles to its own width.

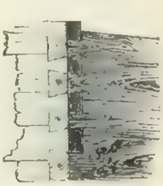
DRAG (v.). To dress the surface of a stone with a drag.

DRAGGING PIECE; **BEAM**; **TIE**. A short tie beam at the corner of a building to receive the foot of a hip rafter and to resist its thrust. It generally bisects the angle formed by the roof plates, its inner end being secured to an angle brace.



Dovetails.

A. The common form, visible on both faces of the corner. *B*. Cut only part way through one piece, forming a Lap Dovetail. *C*. Secret Dovetail, entirely concealed.



Dovetails as used in Swiss Solid-timber Construction to secure the Corners.

DRAGON PIECE, etc. Same as Dragging Piece, etc.

DRAIN. An open or covered (underground) channel or pipe for the conveyance or removal of water or sewage. Drains are usually circular and made of earthenware, porous or unglazed, as well as glazed or vitrified. The term "house drain" is, in the New York Building Law, defined as "that part of the main horizontal drain and its branches inside the walls of the building, and extending to and connecting with the (outside) house sewer." Inasmuch as the term "to drain" means to draw off gradually, to remove by degrees, it would be more correct to restrict the term drain to pipes receiving subsoil water, and to call the pipes removing sewage from houses "sewers." (See Area Drain; Drainage; Dry Area.) — W. P. G.

Barrel Drain. A drain of circular section of brick or stone masonry.

Box Drain. An underground drain of masonry, rectangular in section, commonly covered with flat stones.

Catchdrain. A drain to receive and carry away the overflow of a canal or other open water conduit or open drain.

DRAIN (v.). *A* (trans.). To draw off or convey away liquids, as rain water or sewage; hence, by extension, to provide or construct a drain.

B (intrans.). To run off, or to be conveyed away, as by a drain.

DRAINAGE. The removal of surplus water from the soil, accomplished by open channels, ditches, stone trenches, or by underground pipes or tile conduits. They are generally called "drains" to distinguish them from sewers or conduits for the removal of foul waste water (sewage). Unfortunately, this distinction is not always made. The word "house drain" is often applied to pipe channels which remove house sewage (see House Drainage), although drains for the house are, more accurately defined, pipes removing the surplus of soil moisture, the subsoil water, from building sites. An axiom of sanitary engineering is that a sewer should never perform the function of a drain, and, inversely, drains should not be used as sewers.

The drainage of building sites is a requirement for the salubrity of buildings wherever the soil holds an excess of water, or where there are springs. It is accomplished by using porous or unglazed round drain tiles, made in sizes from 1¼ to 6 inches, and in 1 and 2 foot lengths, laid with open joints in order to gather the water, the joints being protected against obstruction by pipe collars, or by muslin wrapped around the joints. The stone drains formerly used stop up and are not self-cleansing. Drains are laid in generally parallel lines, at distances from 20 to 50 feet. Lateral drains, from 1½ to 3 inches, are connected with larger main drains, which should not connect with foul water sewers. For detached houses, in the suburbs or country, the drain outfall may go to an open road ditch, or to a water course. In city houses usually no outlet for the subsoil water other than the house sewer is available. The subsoil drain must then be properly trapped to prevent gases from the soil pipes or sewer from gaining access to the drains; the trap water seal must be permanently maintained by introducing a roof water pipe, or by other special devices.

To secure dry foundation walls, tile drains are laid along the footing courses, and the drain trench is filled with broken stone and gravel. For houses on a hillside, a good plan to secure dry walls and dry cellars is to build a drain above the upper side of the house, which intercepts subsoil and surface water, and conveys it around the building toward an outlet below the house.

Excessive moisture in the soil under habitations, damp foundation walls, and wet cellars are causes of pulmonary diseases, diphtheria, malarial fevers, etc. Therefore, the drainage of a house is as important as its sewerage.

In a wider sense, drainage includes removal of storm water from roofs, areas, courts, yards, and balconies of buildings. Roofs are drained by means of gutters, conductor heads, and leader or conductor pipes. Vertical rain water pipes are placed either on the outside or inside of houses. Outside leaders are of sheet metal (galvanized iron, copper, lead), and inside leaders of wrought and cast iron. The usual sizes are 3, 4, and 5 inches. Larger sizes are seldom used. The diameter and number of vertical leaders cannot be calculated by mathematical formulæ. An empirical rule requires one square inch leader area to 60 or 70 square feet roof surface. Paved areas, courts, and yards must be drained by pipes of sufficient diameter. In cities having the "separate system" of sewerage, rainfall is excluded from sewers. A special pipe system for leader and yard drainage is required, or else the clean roof water is conducted separately into storage tanks or cisterns. In cities having sewers on the "combined system," rain water is carried off by the conduits for the house sewage, and leader, yard, and area drains must be efficiently trapped.

Road drainage signifies the proper removal, by paved gutters, road boxes, catch basins, and underground conduits, of water falling upon roads and streets.

By extension, the term "country house drainage" is used to designate the method of removal and disposal of sewage. A house "drains" into a cesspool means that the sewage is delivered into an underground brick or stone tank, where it is temporarily stored. (See Cesspool.) Leaching cesspools pollute the water of springs, wells, or cisterns, and frequently become the cause of typhoid fever in the country. Watertight cesspools, if not located too near a dwelling, are sometimes unobjectionable, but the frequent pumping out is troublesome and expensive. Better systems of disposal of the liquid sewage from isolated country houses are the surface and the subsurface irrigation systems, and the bacterial filter bed system. In the former systems the sewage is collected in a small, tight flush tank, and discharged by means of an automatic siphon device into a drain or conduit leading to the sewage field. Here the sewage is distributed over the land, on the surface in open ditches or channels, or at a distance of twelve inches under the surface in porous 2 or 3 inch absorption tiles, laid in regular lines with open joints, and with a slight fall.

In the bacterial filter bed system the sewage is purified by bacterial action in filter beds of masonry or concrete, filled with broken stones, coke, breeze, or coal. The sewage, after being strained of its coarser substances, is discharged into the filter beds, remains for several hours in contact with the bacteria attached to the filtering material, and is discharged, after purification, by means of automatic siphons, or else gate valves operated by hand.

In an agricultural sense, drainage is the art of carrying off surplus water from swampy districts, or from hard clay soils, or land subject to excessive flooding in rainy weather. Agricultural drainage is a benefit to vegetation and crops.

Geo. E. Waring, *Drainage for Profit and Health*; *Elements of Agriculture*; *Land Drainage and Sewerage*; *How to Drain a House*; *Methods of Sewage Disposal*; Glenn Brown, *Healthy Foundations for Houses*; William P. Gerhard, *Disposal of Household Wastes*; *House Drainage and Sanitary Plumbing*; *Sanitary Engineering of Buildings*, Vol. I.; French, *Farm Drainage*; Edw. S. Philbrick, *Disposal of Sewage in Suburban Residences*; Circulars of Department of Agriculture on "Drainage," Washington; Dwight Porter, *The Removal of Roof Water from Buildings*, reprinted in *American Architect*, Aug. 31, 1889; M. N. Baker, *Sewerage and Sewage Disposal*.

— W. P. GERHARD.

DRAIN PIPE. Any pipe for use as a drain.

DRAIN TILE. A tile for constructing water drains, as in draining land. Usually made in two forms; a flat tile to form the bottom of the drain, which is covered by one more or less semicylindrical in shape.

DRAIN TRAP. A trap device intended to prevent the escape of sewer air from sewers, drains, cesspools, or sewage tanks into the house sewers and house pipes. (See House Drainage; Trap.) — W. P. G.

DRAUGHT; -ING. (See Draft; Drawing.)

DRAUGHTING ROOM. Same as Drafting Room.

DRAVIDIAN ARCHITECTURE. That of an ancient province of the peninsula of India, usually considered as occupying the whole southernmost part of the peninsula, including the greater part of the modern presidency of Madras and a part of the protected native state of Mysore. The architecture characteristic of this district extends in a few rare cases beyond its geographical boundaries; the important buildings, which are considered as belonging to the style, are generally assumed to be of the tenth and succeeding centuries, coming down, perhaps, to the seventeenth century of the Christian era. (See India, Architecture of, and the bibliography appended to it.) No separate work seems to be devoted to this style. — R. S.

DRAWBORE PIN. A slightly conical pin, peg, or trenail of hard wood, driven through the cheeks of a mortise and the tenon inserted therein: the hole in the tenon being slightly farther from the end than those in the mortise, the pin draws the tenon with great force into its seat and secures it firmly. Called also Draw Pin.

DRAWING. In the practice of architecture;

A. The process of representing the form of an object on a flat surface, as paper.

B. The picture or representation so made.

(For artistic or "freehand" drawing, see Study.)

Two methods are commonly used in architectural drawing: right line projection, which shows the actual outlines and dimensions of the object and its parts (see Projection), and Perspective, which shows the apparent shape of the object as it appears, or would appear, to the eye. The former method is that used for all working drawings as described below: the latter principally for studies; first, for the satisfaction of the architect himself of the proposed work, who is assisted by the realistic representations of perspective to decide more readily on the form to be given to the proposed structure or any part thereof; secondly, for submission to the client, who can, from such pictorial drawings, know, in advance, what the appearance of the finished structure will be. Such perspective studies thus, to some extent, take the place of models.

Every scheme for building is embodied in drawings made by Right Line Projection, and a Specification; these define all the special conditions of design and construction involved, the latter supplementing by written description what cannot be graphically set forth in the former. In fact, drawings enable the architect, first, to give a definite form to an architectural idea; second, to cause it to be understood by others; and third, to develop the idea into an actual work of architecture. These functions are fulfilled by three classes of drawings recognized in architectural practice: *preliminary drawings* or *sketches, general drawings*, and *detail drawings.* Of these the last two generally constitute what are known as *working drawings.*

Preliminary drawings are the tentative so-called sketches of plans, elevations, and sections, by which the general character of a design is approximately determined. For convenience of study they are generally, in England and in the United States, drawn to the scale of $\frac{1}{8}$ inch to the foot, or, in large work, to a scale of $\frac{1}{16}$ inch or even $\frac{1}{32}$ inch; in other countries they are drawn to approximately corresponding scales according to the metric system. They constitute a series of graphical experiments, in which the architect endeavours to reconcile the best general dispositions of plans and elevations, to adjust his outlines and masses to the best conditions of balance or symmetry, correcting them when necessary by the revelations of perspective sketches, until he has his scheme of architecture so thoroughly in hand that he is in condition to report it intelligibly to his client with approximate estimates of cost obtained by comparison with other work, or by computation. Then follow such modifications or readjustment as may be found necessary or expedient to bring it into harmony with the views of the client respecting design and cost. These *preliminary drawings* illustrate various ways of solving the problem in question. When the choice has been made, and the scheme has thus been made intelligible and acceptable to the client, it becomes necessary to formulate this idea in general and detailed drawings.

General drawings are usually on a larger scale. On these drawings, to avoid the danger of misreading the scale, and to avoid loss of time, all the dimensions are carefully figured, and, often by aid of supplementary marginal diagrams, all the general conditions of structure are carefully explained. This process also gives opportunity to refine and correct the design by a more careful study of detail. This class of drawings includes plans of all the stories, elevations of all the fronts, such general vertical sections as may be necessary to elucidate the design, and such detail, drawn to a still larger scale as, with the assistance of the accompanying specifications, may make the whole scheme clearly evident to the mind of the builder and give him a full and complete comprehension of all the structure conditions as they affect the vital questions of quality and quantity of materials, of character of workmanship, and of cost. Upon the clearness and completeness of these drawings and specifications depend not only the closeness and reliability of the estimates based upon them, and that workmanlike precision of execution which constitutes good building, but immunity from those unforeseen contingencies, known and dreaded by architect and client alike as "extras." In case of contract work these *general drawings*, having been identified by the signatures of the interested parties, form a part of the legal building agreement. They generally comprise from six to twelve or more sheets, made in manifold by various mechanical processes, so that the various classes of workmen employed as subcontractors or otherwise on the building may be furnished with authenticated copies according to their needs. (See Contract; Builder.)

But these, though sufficient to define the architectural scheme and generally to guide the builders, need to be supplemented during the progress of the work by another and generally much more extensive series of drawings, known as *detail drawings*, which often, according to the magnitude or complexity of the work, may bring the total number up to several hundred sheets.

These supplementary detail drawings are required for the use of the general and subcontractors, so that the masons, the stonecutters, the iron and steel men, the fireproofers, the metal workers, the carpenters and cabinetmakers, the marble and tile men, the electric, the heating, and elevator people, the plasterers and decorators, each being furnished with a special set of diagrams and detail sheets, may be enabled in the distant shop, factory, or building yard, to so provide and shape their material that it may be delivered duly at the building site, prepared to be adjusted to its proper place or function in the complicated organism with the least possible delay and the smallest possible chance for errors and misfits. These working sheets embrace, besides explanatory figured diagrams, numerous details of structural, moulded, and carved work drawn at full size. In the case of contract work they are not intended to impose upon the builders any labour or material which has not already been called for in the *general drawings*, a clause in the contract protecting them from the possibility of such impositions by providing for an appeal in case of dispute or disagreement between the contractor and the architect regarding the fair and proper interpretation of the *general drawings*. But the architect must be the sole judge as to the number and character of the third class drawings necessary to secure absolute accuracy of workmanship and to protect the integrity of his design. But this necessary multiplication of working drawings in the elucidation of his design carries with it, for the architect, a serious responsibility; for the cost of correcting all errors occasioned by inaccuracies or oversight in the drawings must very properly be borne by him. For convenience of reference and record copies or tracings of every drawing issued from his office are kept on file by the architect.

Architect's drawings have been defined by the courts as "instruments of service," and as such they have been held to be the property of the architect and not of the client. But as a matter of common courtesy, if not of practical expedience, it is customary to furnish the client for his use a full set of general drawings and a perspective if he requires them.

In the administration of an architect's office, where works of importance are carried on simultaneously, the multiplication of drawings would become a serious embarrassment if the care of them and the accounting for them were not subjected to a rigid system. To this end the originals or tracings, which are retained by the architect, are kept on files properly ordered and readily accessible, and a descriptive record is preserved, wherein the number and title of each sheet is set forth, together with the name of the builder or mechanic to whom the copy or original has been issued, with the date of delivery. It is also customary to require by a provision in the specification that the drawings, being the property of the architect, must not be used on other work, and, so far as practicable, must be returned to him on the completion of the work and before the final payment.

— HENRY VAN BRUNT.

DRAWING BOARD. A board especially prepared with squared edges and flat smooth surface to receive the paper or linen upon which a drawing is to be made. Drawing boards are usually of well-seasoned soft pine, carefully matched and glued, with flush cleats at the ends in the smaller sizes and heavy hardwood back cleats in the larger sizes, secured in such manner as to allow for shrinkage. The drawing paper is secured by drawing pins or by gumming the edges to the board. Panel boards or framed boards are sometimes used for watercolours of moderate size; the paper overlapping the board on all edges, and secured by a frame fitting closely around the board.

— A. D. F. H.

DRAWING CHISEL. A chisel-like instrument having a broad blade with a very sharp oblique end. It is used for trimming the ends of tenons and for cutting or marking deep incisions across the grain of the wood, guided by a square or rule.

DRAWING INSTRUMENTS. Implements used in drawing, as distinguished from painting; particularly those used in geometrical, mechanical (architectural) drawing; the T square, straight edge, triangles, curves, rule or scale, compasses, dividers, ruling pen, dotting pen, and protractor are those commonly used: to which may be added such special contrivances as the Centrolinead, Ellipsograph, Pantograph, Spline, etc.

DRAWING PIN. A metal pin used to fasten a drawing or sheet of paper, tracing linen, or the like, to the drawing board. It has a broad, flat head, a very short round shank or stem, and sharp point. The head is so bevelled or slightly rounded at the edge that the T square and triangle slide easily over it. Called also drawing tack and thumb tack.

DRAWING-ROOM. *A.* A room intended for the reception of visitors and the entertainment of company; originally withdrawing-room, as being the room to which persons withdrew for private intercourse; or, in later times, the room to which the ladies withdrew after dinner. Compare parlour, with which term there has grown to be a confusion, especially in the United States, which should be avoided, if possible. In large houses, the drawing-room is differentiated from the sitting room and the morning room, and in English town houses from the parlour. In America, the term is reserved rather for rooms of considerable size, and of stately arrangement and decoration. In this sense, it is applied to the reception rooms of the larger hotels and the like.

B. Same as Drafting Room, which see.

— R. S.

DRAW PIN. The same as Drawbore Pin.

DRESS (v.t.). To prepare, shape, or finish by cutting or rubbing one or more faces of stone, brick, or lumber; to face.

Brick is commonly dressed by roughly chipping to the required form, and then rubbing on a smooth surface with sand and water. When required to be more elaborately shaped or moulded, the dressing is done by chisels and similar cutting tools in the same manner as stone. These processes are being largely superseded by bricks which are manufactured in a great variety of stock patterns, or by machinery with which bricks of the usual type may be readily and cheaply cut or ground, as for voussoirs. Where only a few bricks are needed, of an elaborate shape, they may be had cheaper by dressing than by moulding.

Lumber is said to be dressed when planed on one or more faces, and is described or specified according to the number of sides which are to be so finished. At the present time, the greater part of such dressing is almost always done by means of machinery in planing mills (see Woodworking Machinery), hand working being resorted to only for small quantities, or to give a more perfect and true finish in parts left somewhat inaccurate and irregular by mill planing. Planing, whether by hand or machinery, commonly includes, not merely the dressing of lumber so as to form true and smooth faces and arrises, but also moulding, either for decoration or for constructive reasons, and such moulding is wholly or in part produced in one operation with the simple planing. Thus, floor boards are commonly manufactured as a stock article, planed on one side, and the edges tongued and grooved, while sheathing and ceiling is to be had finished in a similar manner, and also beaded on one or both edges of the face, or even more elaborately moulded. (See Lumber.)

Stone dressing, while commonly performed by machinery, is more often worked by hand than either brick or wood; first, because of the uneven texture of many kinds of stone, the slow, manual process of chipping is the only available means of dressing; second, because seldom used in pieces long enough to make planing or moulding by machinery expedient; third, because many kinds of surface finish called for are very irregular in character. A combined process of dressing is, however, being rapidly introduced, in which a hammer, punch, or other tool is driven and caused to strike rapidly by mechanical means, — generally electricity, — while it is guided by the workman, who can thus, with very little labour, work mouldings, and even produce elaborately sculptured forms. (See Ashlar; Stone Cutting.) — D. N. B. S.

DRESS CIRCLE. Originally, in British theatres, the first balcony containing the boxes, and set apart for the wealthier class of the audience, who were supposed to appear in evening dress. It usually extended around three sides of the auditorium, the pit being either enclosed by it, or extending under it. In modern times, the term is used more or less indiscriminately to mean a similar part of a theatre, either on the main floor, or on a balcony above the orchestra, and next in importance to the latter, and most often without boxes. (See Box; Orchestra; Parquet; Pit; Theatre.)

DRESSER. A table, shelf, or set of shelves upon which vessels for use at meals are kept permanently. Originally, the dresser served as a carving table and place of preparation for the dishes about to be served; that is to say, it was there that the dressings of the table were prepared. In modern usage, almost entirely confined to a set of plain shelves with or without doors or sliding glass fronts, and set up in a kitchen or serving room.

DRESSING. *A.* In general, any one of the decorative furnishings, such as mouldings, keystones, groins, and the like, projecting from the general surface of a building.

B. In a more restricted sense, the moulded finish or framework around openings; as, for example, the architraves of doors and windows. This is the more common usage in England.

DRESSING ROOM. A room for dressing and for the operations of the toilet; specifically: —

A. In a theatre or similar building, a room used by a performer, sometimes large and elaborately furnished, with a private alcove or part screened off for the actual toilet of the actor or actress, while the rest of the room is used as a reception room for certain privileged visitors.

B. In a bathing establishment, gymnasium, or the like, a place where the bathers may dress and undress, and may leave their clothing while bathing or exercising; often a mere closet closed only with a curtain or partial door.

C. In a mercantile establishment, as for the sale of ready-made clothing, or a tailor's or dressmaker's rooms, often a mere closet in which customers may put on garments.

D. In a residence, a room attached to a bedroom, especially needed where two persons occupy the same bedroom. In the case of a married couple, it is usually held that the dressing room is the husband's place of retirement. In houses of pretension, and in first-class hotels, and the like, it is very common for a bath tub and sometimes other conveniences of the same sort to be provided. — R. S.

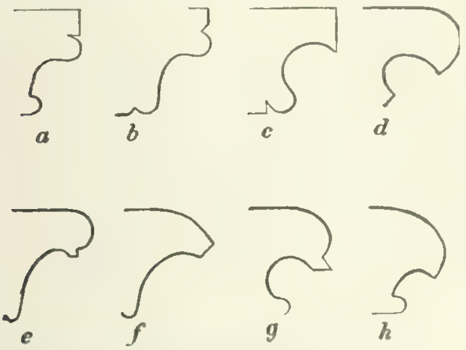
DRIFT (n.). *A.* The thrust or horizontal outward push of an arch or vault.

B. A small tunnel to serve as a guide for the excavation of a larger tunnel or sewer.

DRIFT (v.). In riveting iron work, to enlarge a rivet hole laterally so as to bring it opposite its corresponding hole; a poor expedient to correct inaccurate work.

DRIFT PIN. A tapered steel pin driven into a rivet hole to enlarge it. (See Drift (v.).) — W. R. H.

DRILL. A punch or boring instrument operated mechanically to drive holes through any hard material, as rock or metal, either by being rapidly rotated or by being caused to give blows.



Drips formed by Mouldings; from —

a. The Piazza dei Mercanti, Milan. *b.* The Broletto of Como. *c* and *d.* From Salisbury. *e* and *f.* From Lisieux, Normandy. *g* and *h.* From Wenlock Abbey, Shropshire.

DRIP. Any projecting piece of material, member, or part of a member, shaped or placed so as to throw off water and prevent its running or trickling back to the wall or other surface or part. (See Beak; Lip.)

DRIP LOOPS. (See Electrical Appliances.)

DRIP MOULDING. Any moulding shaped and placed to form a drip.

DRIPPING EAVES. Sloping eaves projecting beyond the walls and not provided with a gutter or eaves trough, so that the roof water is shed upon the ground.

DRIPSTONE. A drip moulding or hood mould to an arch, especially in Gothic architecture. The term is only applicable to exterior architecture; when such a moulding occurs in interior work, it should be called a hood mould. Its section is convex externally, retreating to the wall by bevels and deep hollows. The term is sometimes erroneously used of the ornament at the ends of the moulding, which is properly the boss.

DROMIC, –ICAL. Pertaining to, or having, the form of a Grecian Dromos; said of the early type of Eastern churches, the plan of which is similar to the dromos. In this sense, equivalent to Basilican.

DROMOS. *A.* In Grecian archæology, a race course; seldom the object of architectural elaboration or display.

B. A somewhat enclosed entrance, passage, or avenue forming an approach, as between two rows of columns leading to an Egyptian temple. So called from its similarity to the Greek *dromos* or race course.

DROP. *A.* Any one of the guttæ under the mutules or triglyphs of a Doric entablature. (See Gutta.)

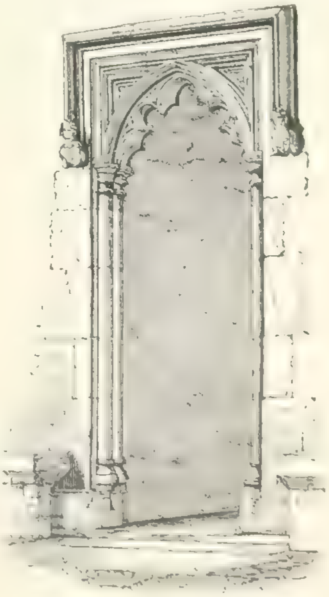
B. Any pendant finish, or ornament, as to the lower end of a newel.

DROVE (n.). A chisel used in stonecutting, about 2 inches wide, intermediate in size between the inch tool and the broad tool.

DROVE (v.). To dress with the drove; generally, the third or fourth process in stonecutting.

DRUM. *A.* One of the nearly cylindrical pieces of which a shaft of a column is built up when it is not a monolith.

B. The vertical wall, circular or polygonal in plan, which carries the rounded part of a cupola; called also Tambour. The drum applies chiefly to the exterior of buildings; thus, in the Pantheon or in the church of Hagia Sophia there is no drum; the cathedral of Florence has a very high octagonal drum pierced with an occulus in each face; and S. Paul's in London has a very lofty drum, which may be considered as having three parts, — a plain basement, a lofty peristyle crowned by a parapet and surrounding a sloping circular wall pierced with windows, and an attic, which last carries the cupola itself. — R. S.



Dripstone from S. Erasmus's Chapel, Westminster.

DRUMMING. (See Cross Bridging, under Bridging.)

DRUM PANELLING. A form of door construction in which the panels are flush on both sides for covering with cloth or leather.

DRY (adj.). In masonry, built without the use of mortar or any cementing material.

DRYING ROOM (also, drying closet, drying loft). A room, or space, for drying, especially one set apart for the drying of clothes, and provided with artificial heat and vent flue for removal of moist air. Drying rooms do away with many of the inconveniences incident to the ordinary drying of the wash, render laundry operations independent of the weather, and in large institutions enable the quick drying of a large amount of clothes. They consist essentially of a wrought-iron frame, covered with a galvanized sheet iron case, in which metal clothes "horses" or racks slide. Clothes dryers must be fireproof and rustless. Each vertical rack has a number of horizontal galvanized iron bars on which the clothes are hung. The continually admitted fresh air is heated in the dryer by steam or hot water coils, by hot air drums, or by gas burners. Ventilation is essential to remove the expelled moisture, the hot air, and the laundry odours. In large institutions and in steam laundries drying is always accomplished by steam. Racks are generally 7 feet high, 7 feet long, and occupy each from $6\frac{1}{2}$ to $7\frac{1}{2}$ inches space in width. A three- or four-rack dryer is sufficient for the washing of a large family. For domestic laundries a very handy and efficient apparatus is the combined laundry stove and dryer. In this a single fire in the laundry stove boils the clothes in the wash boiler, heats water in the laundry boiler, heats flatirons, and furnishes heat for drying the clothes. It occupies but little room in the laundry, and avoids the smell of washing arising when clothes are dried indoors. — W. P. GERHARD.

DRY ROT. Decay in wood of which the primary cause is dampness, and, especially, lack of ventilation. If the end of a timber is built up too closely in a wall, or enclosed in an iron shoe, it will be attacked by this decay, even if well seasoned.

DUBAN, JACQUES FÉLIX; architect; b. Oct. 14, 1797 (at Paris); d. Oct. 8, 1870 (at Bordeaux).

Duban was a pupil of François Debret (see Debret, F.), and the *École des Beaux Arts*, and in 1823 won the *Grand Prix de Rome* in architecture. After acting as assistant of Debret at the *Ecole des Beaux Arts* he became chief architect of that building in 1832. He constructed from his own plans the main building of the school, containing the hemicycle, the library, etc. He also arranged the interesting collection of architectural fragments in the open court. He occupied himself with the improvement and decoration of this building until his death. In 1840 he undertook the restoration of the Sainte-Chapelle, Paris, but gave up this work to Jean Baptiste Lassus (see Lassus) in 1849. In 1845 Duban began the restoration of the château of Blois, with which he was occupied twenty-five years. About 1845 he restored the château of Dampierre for the Duc de Luynes. Duban began the reconstruction of the château of Chantilly, for the Duc d'Aumale, but was interrupted by the political disturbances of 1848. In 1849 he was appointed architect in charge of the château of Fontainebleau and of the Louvre. He made extensive restorations at the Louvre, but was superseded by Louis Visconti (see Visconti) as architect of that building in 1853.

Beulé, *Éloge de Duban*; César Daly, *Funérailles de Félix Duban*; Eugène Müntz, *Guide de l'École nationale des Beaux Arts*; Chabat, *Ecole Nationale des Beaux Arts* in *Encyclopédie d'architecture.*

DUBBING OUT. The operation of levelling or smoothing a wall of masonry by filling up the hollows before the final coat of cement or stucco is applied.

DUBROEUCQ (DE BREUCK), JACQUES; sculptor and architect.

Dubroeucq is mentioned by Guicciardini (op. cit.) as *Natif de Saint Omer, gentilhomme de race, graveur et tailleur expert et sachant bien l'architecture.* He was a native of Flanders, visited Italy, and established himself in Antwerp. For Maria of Hungary, Queen Regent of the Netherlands, he built a palace at Binche and several fortresses. The famous Jean Bologne was his pupil.

Desjardins, *Vie de Jean Bologne*; Guicciardini, *Description de touts les Pais-Bas.*

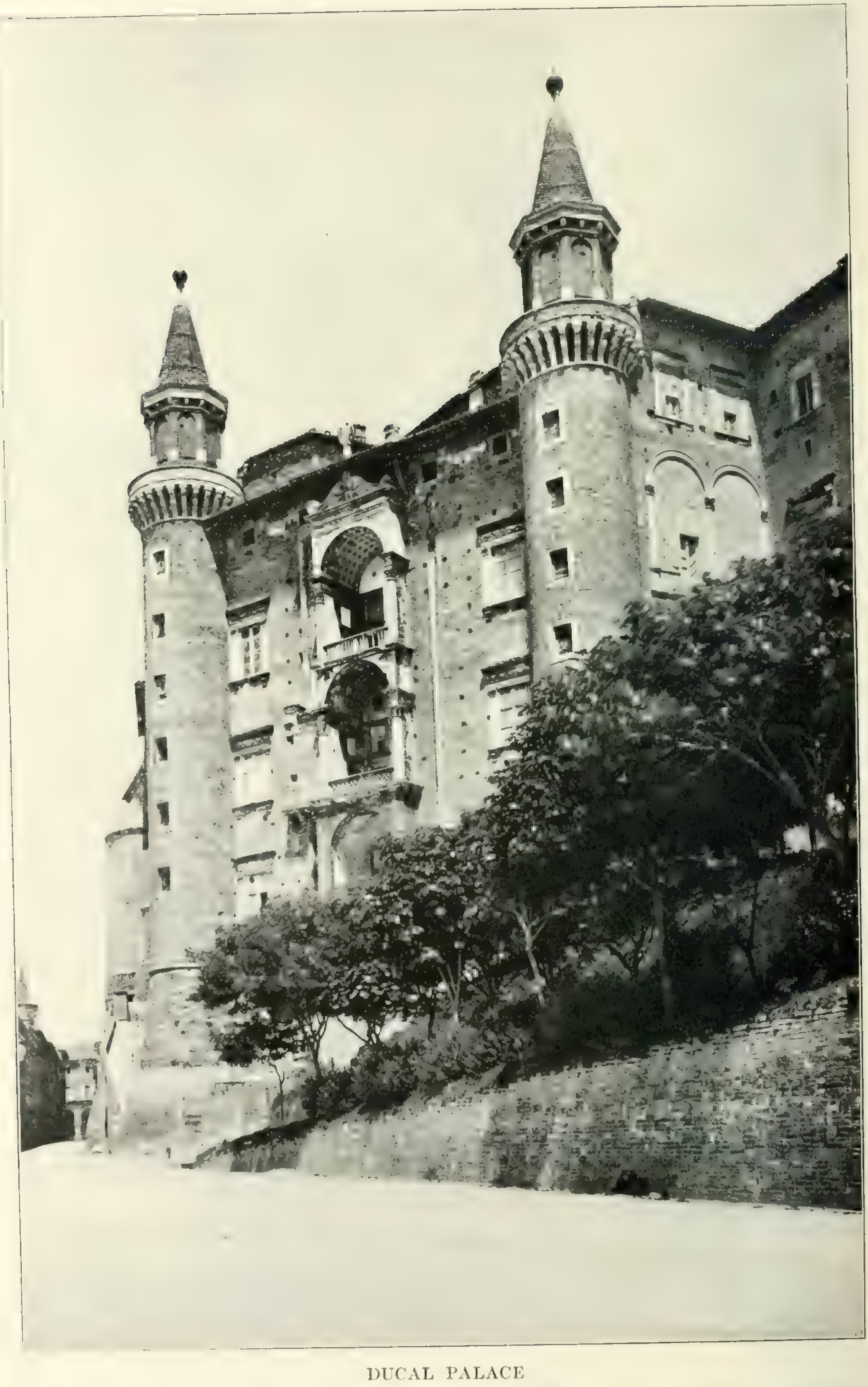
DUC, GABRIEL LE; architect; d. 1704.

Le Duc studied in Rome. On his return to Paris he was associated with Le Muet (see Muet), who, after 1654, was made architect in chief of the church and monastery of Val-de-Grâce, Paris. Le Duc succeeded Le Muet about 1658, and built the vaults, the dome, all the upper part of the building, and carried out the detail of the interior. In building the dome he is supposed to have followed the design of François Mansart (see Mansart, N. F.). Many of his most important buildings have been destroyed.

Ruprich-Robert, *L'église du Val-de-Grâce.*

DUC, LOUIS JOSEPH; architect; b. Oct. 15, 1802 (at Paris); d. Jan. 23, 1879.

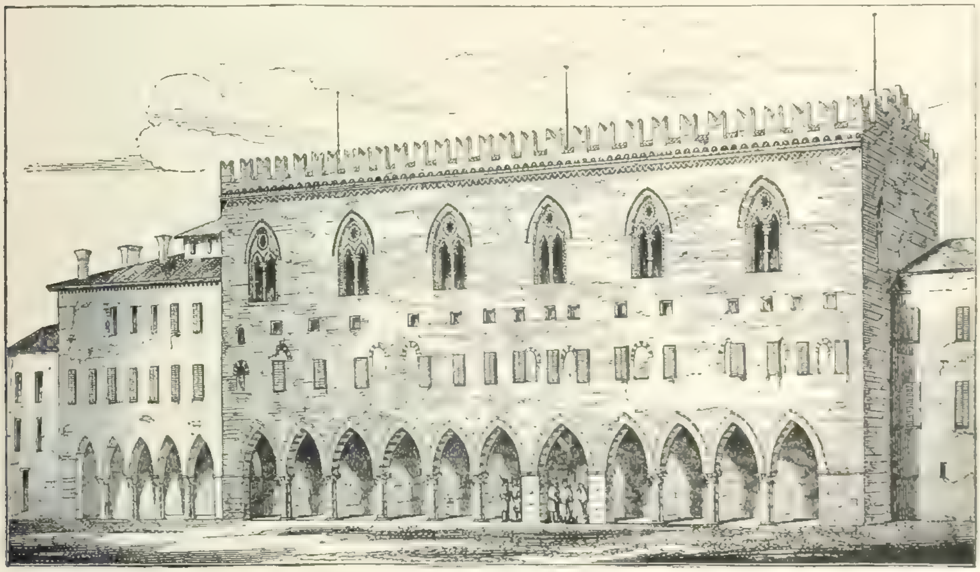
Duc was a pupil of Percier (see Percier) at the *Ecole des Beaux Arts.* In 1825 he won the *Grand Prix de Rome* in architecture. Returning to Paris he was made inspector, under Jean Antoine Alavoine (see Alavoine), of the works at the *Place de la Bastille* and the *Colonne de Juillet.* In 1834 he became architect in chief of this monument, the design for which he modified. In 1840 he was appointed architect of the *Palais de Justice* (Paris), the



DUCAL PALACE

That at Urbino, in Umbria; begun about 1450 and celebrated for the beautiful details of its interior courtyards and halls. The round towers belong to an earlier and fortified castle, and the Renaissance windows and *loggie* are for the most part insertions in the ancient castle wall.

reconstruction of which was the chief work of Duc's life. In 1842 he transformed the old *Cour des Comptes* built by Gabriel (see Gabriel, J. J.) into the hôtel of the *Préfecture de police* (burned in 1871); in 1845 he began the buildings on the *Rue de Barillerie;* in 1850 he restored the *Tour de l'Horloge.* In 1861 he began the building of the *Cour de Cassation;* between 1857 and 1868 he built the monumental façade on the *Place Dauphine;* in 1872 he began the restoration of the *Salle des Pas Perdus,* which had been burned the previous year; all these buildings being portions of the *Palais de Justice.* His plans for the improvement of the *Palais de Justice* won for him a medal of the first class at the exposition of 1855, and in 1869 the great prize of 100,000 francs given by the Emperor Napoleon III. (b. 1808; d. 1873). In 1863 Duc was made *inspecteur général du conseil des bâtiments civils.*



Ducal Palace, Mantua, Italy.

Charles Lucas, in *La Grande Encyclopédie;* Maurice du Seigneur, in Planat's *Encyclopédie.*

DUCAL PALACE. The official residence of a sovereign prince bearing the title of Duke (duc, duque, or Herzog). Among the most celebrated of the buildings commonly called thus are (1) that of Mantua; an extensive group of buildings including a mediæval strong castle and an immense palace begun in the fourteenth century, but frequently altered and modernized, and containing much work of Giulio Romano, which, though not always perfect in taste, is full of variety and suggestion. (2) That at Nancy; the ancient residence of the Dukes of Lorraine, a building of which a large part is still of the latest French Gothic, but which is generally modernized and used for a museum. (3) That of Urbino, in Italy, province of the Marches; the residence of the old Dukes of Urbino, and still in excellent unaltered condition. There is no more interesting piece of civic or domestic architecture of the Italian Renaissance than this extensive palace with its beautiful court and refined interior details. (4) That of Venice (for which see Doge's Palace). — R. S.

DUCCIO, AGOSTINO DI. (See Agostino di Duccio.)

DUCERCEAU or **DU CERCEAU.** (See Androuet, called du Cerceau.)

DUCHESS. (See Slate.)

DUGOUT. A dwelling wholly or partly constructed in the ground, preferably in a bank or slope. The walls are continued upward or outward from the excavation by utilizing the earth thrown out, together with sod or stones, or both. The walls above ground, or the front where the excavation is in a slope, are finished with sod, stone, boards, canvas, or logs, according to the resources of the locality or of the individual builder. The roof is usually of earth and sod on poles, with a slight pitch to each side, but it may be of any material available. During the building of the Union Pacific Railway the dugout was especially popular. In the treeless Missouri Valley and similar regions it took the place of the settler's log cabin of Eastern forest regions. Sometimes a species of dugout has been made in a vertical bank of a creek or arroyo, like a niche, with a blanket to serve as a front wall. — F. S. D.

DUMB WAITER. A. Originally, a piece of furniture for a dining room, consisting generally of a set of shelves arranged to hold dishes and mounted upon easy running castors in such a way that it could be wheeled to the side of a table. In some English eating houses, a dish from which the customer is to be served is in this way brought close to him so that he sees the carver who is engaged in serving him.

B. An elevator or lift of a small kind, especially one intended for carrying dishes from the kitchen to the dining room or serving room above or below. — R. S.

DUNGEON. *A.* Same as Donjon; the more modern English spelling before the antiquarian movement which led to the adoption, for the Keep itself, of the French mediæval form.

B. A prison cell of especially repulsive or disagreeable character, as an underground vault with but little light. The term is evidently that properly applied to the whole structure transferred to that part of it which most affects modern imagination.

DUODECASTYLE. Same as Dodecastyle.

DUOMO. A cathedral church; the common Italian designation; corresponding to the German Dom and derived like Dom and like our dome from the Latin *domus*, a house, *i.e.* the house of God. It is applied to none but true cathedrals; the basilica of S. Peter's is not a duomo.

DUPASQUIER, LOUIS; architect: b. 1800 (at Lyons, Rhône, France).

In 1848 he was made diocesan architect of the departments of l'Ain and Saône-et-Loire (France), and in that capacity restored the church at Brou and the cathedral of Autun. Dupasquier built the *Hôtel des Beaux Arts* at Lyons and many churches in different parts of France. He published *Monographie de Notre Dame de Brou* (Paris, 1842, folio).

Bauchal, *Dictionnaire*.

DUPÉRAC, ÉTIENNE; architect, painter, and engraver: b. about 1535; d. 1604.

Dupérac passed a part of his life in Italy, where he made numerous engravings dated between 1565 and 1578. These plates are published under the title *I Vestigi della Antichità di Roma* (1575). According to Félibien (op. cit.) Dupérac was employed at the Tuileries in 1599. It is possible that he designed the old *Pavillon de Flore*, the gallery connecting with the *Pavillon Bullant* and the western half of the *Grande Galerie du Louvre*, usually attributed to Jacques Androuet du Cerceau (II.) (see Androuet du Cerceau, J., II.).

Mariette, *Abecedario*; André Félibien, *Entretiens sur les vies et les ouvrages des plus excellents peintres*, etc.; Bauchal, *Dictionnaire*; Robert Dumesnil, *Le peintre graveur français*; Von Geymüller, *Les du Cerceau*.

DUQUESNOY, FRANÇOIS (FRANÇOIS FLAMAND, FRANCESCO FIAMMINGO); sculptor; b. 1594 (at Brussels); d. July 12, 1642 (at Livorno, Italy).

Duquesnoy learned the rudiments from his father, Henry Duquesnoy, a Flemish sculptor. He was recommended by the painter Rubens to the Archduke Albert, of Austria, sovereign of the Catholic Netherlands, who gave him a pension which enabled him to visit Italy. He was employed in the decoration of the Baldacchino at S. Peter's. He made a relief representing a Concert of Cherubim, in the church of Santi Apostoli, Naples, a bas-relief of Children Playing, in the royal palace at Madrid, a great ivory crucifix, in the collection of Prince Lichtenstein at Vienna, etc. Duquesnoy was remarkably skilful in the representation of children. He was invited by the Cardinal Richelieu to establish a school of sculpture in Paris, but died at Livorno (Italy) on his way to France. His brother Jérôme, also a sculptor, left much work in Flanders.

Bellori, *Le vite de' Pittori, Scultori et Architetti Moderni*; Fétis, *Notice sur Duquesnoy*; Mariette, *Abecedario*.

DUQUESNOY, JÉRÔME. (See Duquesnoy, François.)

DURAND, JEAN NICOLAS LOUIS; architect; b. Sept. 18, 1760; d. Dec. 31, 1834.

At the age of sixteen, Durand entered the atelier of Étienne Louis Boulée, and in 1780 won the second *Grand Prix d'Architecture*. In 1795 he was made professor of architecture in the newly organized *Ecole Polytechnique* (Paris), and retained that position for thirty-nine years. He published *Recueil et parallèle des édifices . . . anciens et modernes* (92 pls. folio, Paris, 1800); *Précis des leçons d'architecture données à l'École Polytechnique* (2 vols. 4to, Paris, 1802–1805): *Partie graphique des cours d'architecture faits à l'École Polytechnique* (vol. 4to, Paris, 1821).

Rondelet, *Notice historique sur J. N. L. Durand*.

DURANDUS (DURAND); architect.

The inscription *Durand me fecit* is found on one of the vaults of the nave of the cathedral of Rouen. On account of similarity of workmanship, Deville supposes that all the vaults of the nave were built by him.

Deville, *Revue des architectes de la Cathédrale de Rouen*.

DURANTEL, JEHAN; architect.

About 1569 Durantel built the *Halle aux draps* (cloth market) of Paris. Feb. 24, 1578, he was called in consultation concerning the construction of the *Pont Neuf* in Paris. He appears several times in the records of that work in association with the Guillain (see Guillain) father and son, Pierre Chambiges (II.), (see Chambiges, P., II.), and Jean de Verdun.

De Laborde, *Comptes des bâtiments du roi*; Bauchal, *Dictionnaire*.

DURBAR. In India. *A.* A state reception or audience, hence: —

B. A hall of audience.

DÜRER, ALBRECHT; painter, engraver, and goldsmith; b. May 21, 1471; d. April 6, 1528.

The great painter and engraver, Albrecht Dürer, in 1521–1522 made designs for the decoration of the *Rathhaus* at Nuremberg. He designed metal work and wrote books on proportion and colour. In the title of his work on fortification he is called an architect, *Alberti Dureri pictoris et architecti præstantissimi de urbibus, castellisque condendis*, etc., published after his death (Paris, 1535).

Ephrussi, *Albrecht Dürer et ses Dessins*; Kugler, *Handbook, German, Flemish, and Dutch Schools*.

DURN. A doorpost in the proper sense of the word "post," *i.e.*, when formed of a timber; a door frame, when so constructed. (N. E. D.)

DURNSTETTER, HEINRICH; architect. (See Egl, Andreas.)

DUST BIN. A permanent receptacle for dust and other refuse, as of a dwelling. In large English houses this is treated as a matter of importance and as requiring thought in its disposition and management. In the United States the custom may be more general of using barrels or small movable receptacles, and carrying them away frequently to be emptied.

It is required that a dust bin should have tight doors; above for the reception of rubbish, and at the bottom for its removal. Also that it should be in a very accessible place, and far removed from those parts of the house in which the occupants spend their time. Even with the utmost precautions frequent emptying is important. — R. S.

DUST FLUE; SHAFT. A flue or shaft provided for the conveyance of dust or rubbish from one or more upper rooms or floors to a dust bin or other receptacle in the cellar or in an area or outside space reserved *ad hoc*. It should be provided with self-closing air-tight doors at every opening. A dust shaft from the hearth or grate of a fireplace is commonly called an ash chute.

DUTCH ARCHITECTURE. (See Netherlands, Architecture of the.)

DUTCH BARN. In Great Britain, a shelter less complete and less thoroughly enclosed than a barn in the usual sense. Three sorts are described: one having a fixed roof but otherwise imperfectly covered, as by siding, which form is not expected to remain perfectly weather-tight; another in which the roof slides up and down between angle posts like the hay Barrack; another which is a mere shed for the temporary shelter of a loaded wagon or the like.

— (A. P. S.)

DU TEMPLE, RAYMOND. (See Raymond du Temple.)

DWANG. A short strut for Bridging.

DWANGING. (See Cross Bridging, under Bridging.)

DWARF (adj.). Lacking in the required or customary height; low or short.

DWARF DOOR. One 3 or 4 feet high, whether complete, or forming the lower part of a divided or Dutch door.

DWARF WAINSCOTING. In Great Britain, wainscoting covering only the lower part of the walls of a room, usually 2 feet 6 inches to 5 or 6 feet high. In the United States, a dado of woodwork; rare, as wainscoting is there seldom used for the whole wall.

DWARF WALL. A wall of less height than a full story, or which does not rise to the full height required for screening or protection, and, therefore, is often topped with a fence or railing. The Bahut, or low wall, which carries the external roof of a Gothic building and the eaves proper, is a dwarf wall.

DWELLING. A building used for residence. (See Apartment House; Cabin; Castle; Château; Cot; Cottage; Flat; Hotel; House; Inn; Manor House; Palace; Tenement House.)

DYNAMO. A popular abbreviation of dynamo-electric machine. The term is most often applied to that form of the machine which is properly called generator. (See Dynamo, under Electrical Appliances.)

DYOSTYLE. *A.* Same as Distyle.

B. In French, having coupled columns, like the east front of the Louvre. It should not be confounded with Diastyle.

E

EAGLE. *A.* A pediment of a Greek building; the rarely used translation of *aetos*. Also the tympanum or recessed panel of such a pediment.

B. A reading desk or lectern, especially that used by an officiant in a church; properly applied only to one which has the form of a bird. Such eagles of brass or similar metal were common in the Middle Ages, and the custom of using them still continues.

EAR. Any relatively small projecting member or part of a piece or structure; whether for a structural purpose, as a lug, or merely a decorative feature, as an acroterium or crosset.

EARLY ENGLISH ARCHITECTURE. The earliest style of Gothic architecture in England, so styled by Thomas Rickman (see Rickman), and the corresponding style in Scotland. This may be considered as beginning with the east end of Canterbury cathedral about 1175, and as ending with the accession of Edward I. The style next succeeding is the Decorated.

EARTHEN GROUT. Grout made with adobe or other earth. (See Cajon; Pisé.)
— F. S. D.

EARTHENWARE. (See Brick; Keramics; Terra Cotta; Tile.)

EARTHWORK. *A.* Work done in removing earth, gravel, loose stone, and the like. (See Excavation.)

B. With the article, a mound, rampart, or the like; used especially in fortification.

(See Retaining Wall and bibliography under that term.)

EASEMENT. *A.* A curve formed at the juncture of two members, to one or both of which it is tangent, and which would otherwise meet at an awkward angle; as where the sloping portion of a hand rail meets the horizontal part, or where a sloping hand rail is curved to meet a newel perpendicularly.

B. (In Law, see Legislation.)

Level Easement. One made in a horizontal plane; so distinguished from Ramp.

EASING. Same as Easement.

East End: Church of Northborough, Northamptonshire.

Type of simplest form. Compare the photographic plates.

EAST END. The chancel end of a Christian church; so called from the mediæval practice of erecting churches with that end toward the east, in which direction the priest would face when officiating at the altar. (See Apse; Chancel; Chapel; Lady Chapel, under Chapel; Choir; Church; Orientation.)

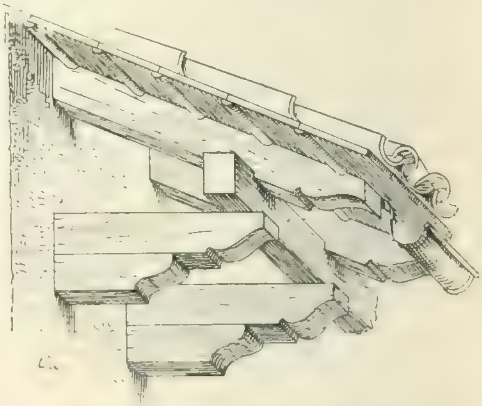
EAST WINDOW. In church architecture, a window in the choir end, which is commonly the east end. The term would hardly be used for any window in a church having a rounded chevet or apse; but the square-ended churches, especially common in England though existing elsewhere, often have large and splendid windows at this point. Some of these are of enormous size. That of Carlisle cathedral, 27 feet wide, has nine lights divided by two larger and six smaller mullions, and a great triangular head filled with flowing tracery. That of Gloucester is of about equal importance, and these two windows are of the middle of the fourteenth century. — R. S.

EATING ROOM. Any room principally intended as a place in which to eat meals; especially: —

A. Such a room in a factory, institution, or the like, for the employees or inmates.

B. In English houses, at about the commencement of the nineteenth century, a room where the ordinary family meals were served; as distinguished from the dining room, which was reserved for more formal occasions. (Compare Breakfast Room; Dining Room; Morning Room.)

EAVES. The lower portion of a sloping roof near the walls; especially, such a part projecting beyond the walls, and forming an overhanging drip for water. (See Dripping Eaves.) (Cut, col. 845.)



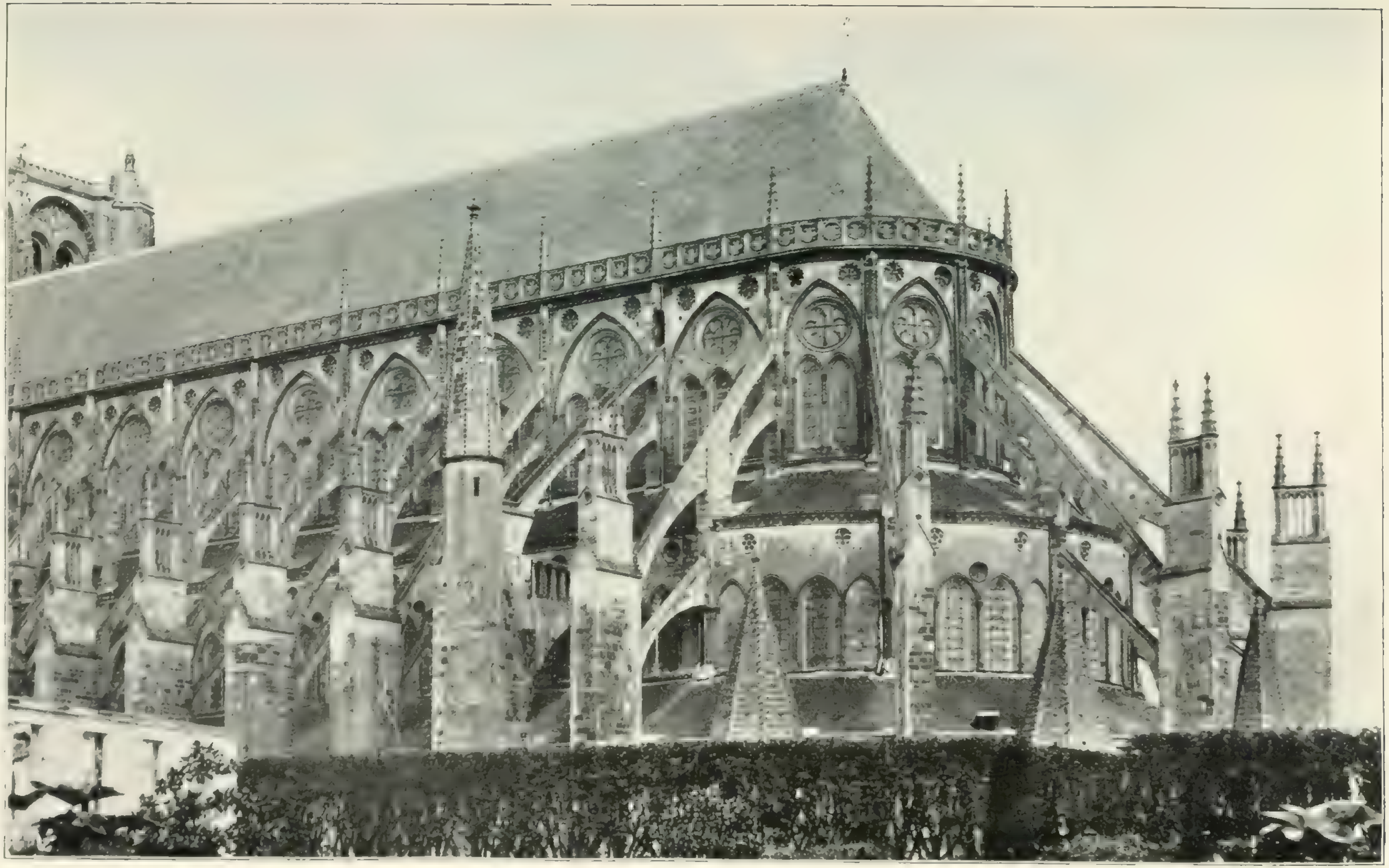
Eaves of a House in Saragossa, Spain.

The corbels, each of two horizontal timbers, carry a plate which supports the rafters.

EAVES BOARD; EAVES CATCH. A feather-edged board at the lower edge of a tiled or slated roof on which is laid the lowest course of tiles or slates; designed to give to that course the same pitch with those above.

EAVES CHANNEL. A channel or small gutter at the top of a wall to convey the roof drippings to spouts or gargoyles; particularly, one cut in the topping course or in a corbel table serving as cornice. — (A. P. S.)

EAVES LATH. A heavy lath or similar strip of wood used in cheap work under the



EAST END

That of Bourges (Cher), western France. Like most large French churches, the eastern termination retains the apse-like form, constituting what is called a chevet. This should be contrasted with the square east end of Lincoln cathedral.

lowest course of tiles or slates in place of a proper feather-edged Eaves Board.

EAVES TROUGH. Properly, a trough or boxlike gutter of metal or wood, attached to, or immediately under, the eaves, to receive the roof water and convey it to the spouts or leaders. Hence, any gutter so situated.

EBONIZE (v.). To finish, as wood, so as to imitate ebony; to stain black.

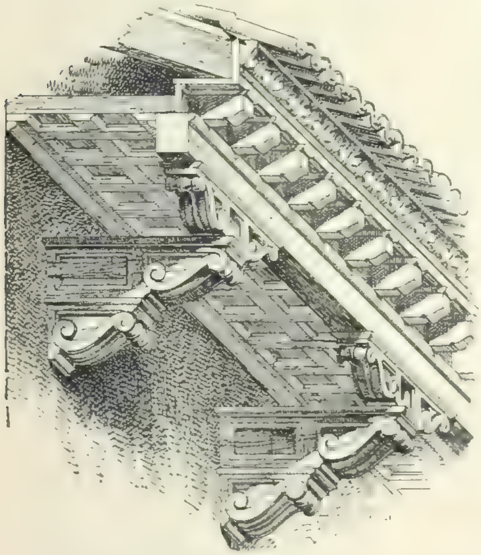
EBOR, JOHN DE; ecclesiastic and architect.

John de Ebor, abbot of Fountains Abbey (England), began the erection of the abbey church in 1209.

Britton, *Architectural Antiquities.*

ECCLESIOLOGY. The study of church services, church building, and of the arts and practices which pertain to these.

ÉCHAUGUETTE. A turret, watch tower, or other place, provided for guards or watchmen; usually, in mediæval fortifications, corbelled out from a curtain wall or from a salient angle, and dominating the battlements, either open or with a roof. Hence, in modern usage, an angle turret springing from a corbel or cul de lampe, as in many late Gothic and early Renaissance houses in France and Germany.



Eaves of a House in Saragossa, Spain.

The corbels carry bolsters which support the plate, which carries a course of horizontal timbers partly concealed by a parallel soffit. The rafters receive no support at their ends, beyond the slight steadying effect of the boxing.

ECHEA: ECHEIA (ἠχεῖα) (pl.; not known to be used in singular). In Greco-Roman archæology, one of a number of bronze or earthen vases which, according to Vitruvius (V., 5, and an allusion, I., 1), were commonly set in cells under the seats of a theatre to reënforce the voices of actors and chorus by their supposed sonorous properties. The theatre at Aizani in Asia Minor has chambers corresponding with Vitruvius's rules, but there is no sign of vases and no explanation of the purpose of the chambers. (See Durm, *Die Baukunst der Griechen*, in the Darmstadt *Handbuch*.)

ECHINUS. *A*. The circular, cushionlike member intermediate between the square abacus above and the necking or top of the shaft below, in capitals of the Doric, and hence, a similar member in other orders. In the Greek Doric, its profile varies from a very convex almost hyperbolic curve (Corinth, Selinus) to a nearly conical form (Portico of Philip, Delos); in the best examples (*e.g.* Parthenon) it is an extremely subtle curve. The Roman echinus is an ovolo in section; in some cases carved with the egg and dart; so also in modern and Renaissance examples. The Ionic capital also has an echinus, partly hidden by the volutes; this is invariably carved with the egg and dart, both in Greek and Roman, as well as modern, examples.

The word is sometimes inaccurately used to signify an ovolo moulding, and even the egg and dart ornament. — A. D. F. H.

ECHO. A sound repeated by reflection from some obstructing surface. It is akin to reverberation and residual sound, but the term may, to advantage, be reserved for the distinct repetitions of the original sound that occur when the reflecting surface is at a considerable distance from the source and from the auditor. When there are two or more large, reflecting surfaces, and the path of the sound is such that it is reflected several times, passing the auditor and giving rise to several repetitions of the original sound, it is known as a multiple echo.

There are a number of remarkable echoes, both architectural and natural, giving many distinct repetitions. Contrary to a statement frequently made, based on imperfect attempts, an exact copy of the architectural conditions will result in an exactly similar echo. It is a perfect and unvarying result of the conditions imposed.
— W. C. S.

ECLECTICISM. In modern architectural design, the theory and practice of those who advocate the free use of principles, forms, and details chosen from all the historical styles.

The consistent and logical growth of the historical styles of architecture was possible only through the concentrated efforts of an intelligent race of builders — working up to an ideal, constantly advancing, yet accepted and definite. But modern architects, confused by the enormous mass of precedent placed at their disposal by the art of the photographer, and by knowledge of the various conditions affecting the growth of the styles, which has been revealed to them by modern investigation, can have no ideal of universal acceptance, upon which to unite in profitable emulation, but must have many ideals often conflicting and inharmonious.

This serious dilemma, in which the modern architect seems to be baffled by the extent and precision of his knowledge, has created many schools at variance as to the best use to be made of this rich inheritance. Some have agreed upon the theory that the only architecture capable of progress is one based upon the reconciliation of decoration with construction, especially as illustrated by the practice of the lay builders of the Middle Ages, and have consequently created what is known in England and America as the Gothic Revival. Others have ardently claimed that the only way of adequately expressing modern conditions of living in terms of architecture was by the recrudescence of the style which had its rise among the most civilized nations of antiquity, which was forgotten in the Dark Ages, which was revived with the revival of learning, and has since accompanied and illustrated all the civilizations since the fifteenth century. These are the classicists, who consider that there is no virtue save in the application of classic formulæ to modern art. Another class, without serious convictions, have been content to practise in the style in which they find they can express their ideas with the greatest fluency. Others, called the eclectics, proposing to meet the ever-varying conditions of modern use, materials, and methods with as little embarrassment as possible from strong predilections for any style, have considered that their whole inheritance of architectural form — Greek, Roman, Romanesque, Moresque, Mediæval, and Renaissance, with all their innumerable variants — was equally at their service, to be drawn upon without prejudice or reserve, according to its present applicability. Their belief has been that arbitrary exclusions or inclusions in the use of precedents are not only narrow and irrational, but fruitless, because contrary to the scientific spirit; that the style of our time cannot be forced in any direction by theory, but must necessarily be subject to the same conditions of evolution as our language, and that the hope of modern architecture must rest upon a similar basis; that, as the long succession of modern fashionable revivals of old styles has apparently produced no lasting results, we should use all that has come to us from the past without arbitrary exclusions, as it may be applicable to the expression of our needs and minds, thus enlarging our resources of form, — our vocabulary, — and trusting that, according to the laws of evolution, only those forms which are fit and proper, practically and æsthetically, will survive in the new environments, and become permanent and available features of modern style. In other words, they believe that true progress is possible, not by working up to any one ideal, chosen from the past by whatever process of selection, but by letting a new, broader, and far more prolific ideal develop and establish itself gradually from a large and liberal system of experiment with precedent. (See Design, II.) — H. VAN BRUNT.

ÉCOLE DE MÉDECINE. In French, a medical school; especially one such in Paris, a national institution, south of the Seine, including some buildings of our own time, and of great interest as specimens of modern designing adapted to the requirements of the edifice.

ÉCOLE DES BEAUX ARTS. In French, a school of fine arts, especially the national establishment which occupies buildings on the south bank of the Seine in Paris. Architecturally, these buildings are not very important, though there are façades of different epochs from the reign of Louis XVIII. to the reign of Napoleon III. (For the school as an educational influence, see Architect, The, in France; and School of Architecture.)

ECPHORA. The projection, as of one part beyond another, used by Vitruvius (III., Chap. III.) in a special sense, as of the projection of the base beyond the shaft.

EDELIN (**EDELINUS**); abbot and architect.

Edelin was abbot of the monastery of Weissenburg (Elsass, Germany) from 1262 to 1293. He rebuilt the church of his abbey, which still exists. He built also a refectory, and established subterranean furnaces to warm his monastery.

Gerard, *Les artistes de l'Alsace.*

EDGE BUTT HINGE. (Same as Butt Hinge, under Hinge.)

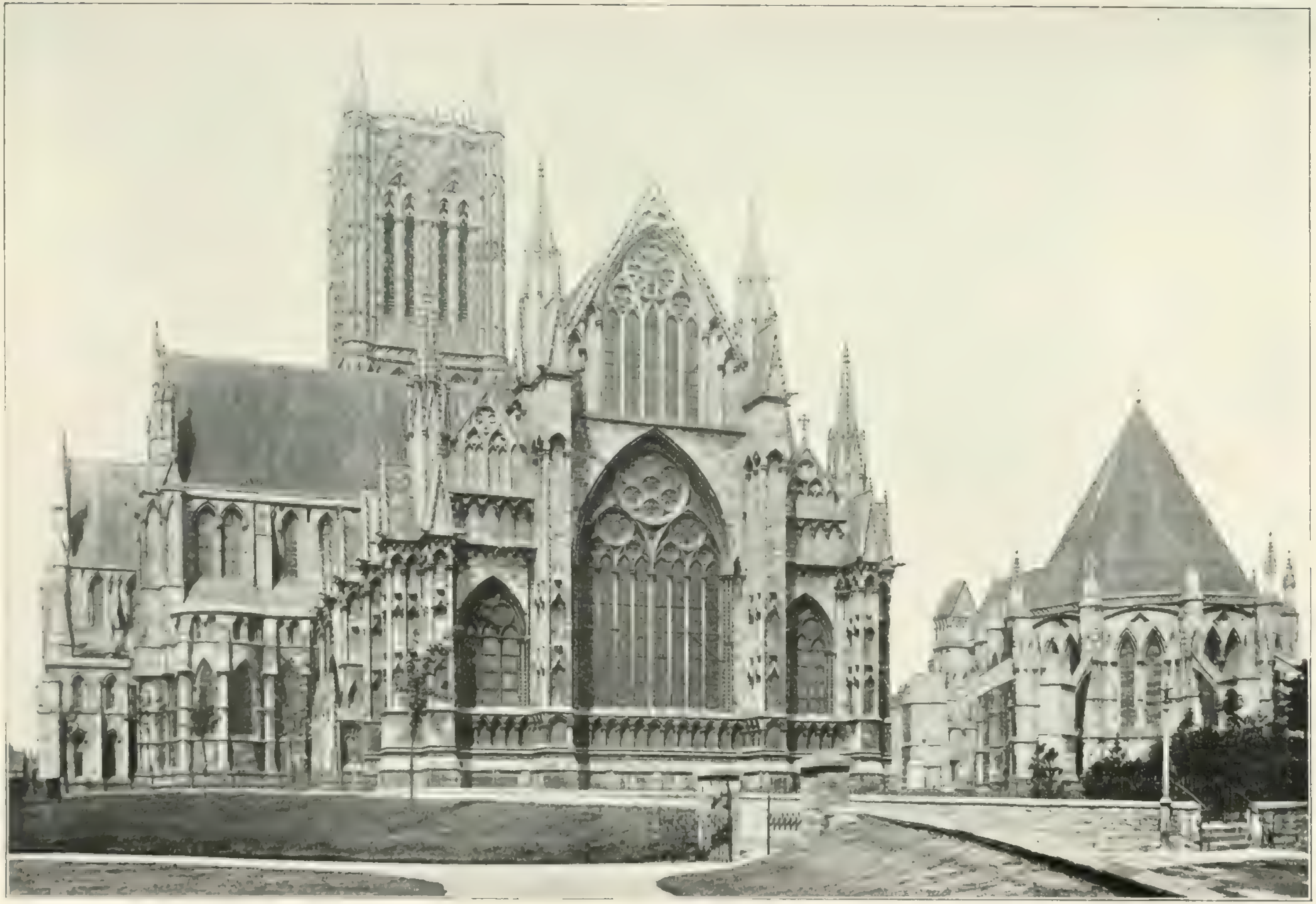
EDGING. The operation of trimming the edges, that is, the narrow, upper or lower faces of rafters, joists, or ribs to a required plane or surface, whether by cutting down or furring out; called also Ranging (cf. Backing).

EDUCATION OF THE ARCHITECT. (See Architect, The, in England; in France; in Italy; Fellowship; School of Architecture; Societies of Architects.)

EFFLORESCENCE. A whitish powder, formed by slow chemical process, on the surface of various substances. The white alkaline efflorescence upon brickwork, and to a less extent on stone, laid up with the natural hydraulic cements, not only produces an unsightly appearance, but it promotes the disintegration of the surface. The material is in some cases a nitrate or carbonate of potash, more frequently a carbonate or sulphate of soda. If removed, it usually forms again in a short time. No absolute remedy for it is known. General Gillmore's experiments indicate the use of eight to twelve pounds of any fatty substance, thoroughly mixed with one hundred pounds of quicklime, which is then slaked and incorporated with the mortar made from each barrel of natural cement. The cements carrying aluminate of calcium are the most alterable.

— W. R. HUTTON.

PLATE XXIX

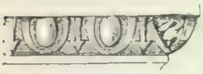


EAST END

That of the cathedral at Lincoln, Lincolnshire. The whole of the East End proper is of the "Decorated" style, and this, together with the great central tower, is of the thirteenth century. Much fault has been found with the gable window raised above the great east window, and with the sham gambles masking the aisles. The chapter house on the right is one of the finest in England, an octagon with a central pillar and beautiful system of flying buttresses, which, however, seem out of place, as there is no aisle for them to span.

As this efflorescence destroys the effect of decorative painting, various devices have been used to prevent its passing through the work. The only effective one seems to be, covering the wall surface, either of the brickwork or of the plastering, with tinfoil or some other impervious film, as is often done in New York. The painted walls of the House of the Faun (which see) were covered with sheets of lead before the painting was done (see Mau's *Pompeii*), and this may have been done to stop the efflorescence. — R. S.

EGG AND ANCHOR; **EGG AND DART**; **EGG AND TONGUE**. An ornament applied to a convex rounded moulding, and consisting of a series of approximately oval projecting rounded surfaces of small size, each one surrounded by a groove and a raised rim, between which rims are inserted, one between every pair of the "eggs" with their enclosing ridges, a sharp-pointed member calculated to contrast in the most forcible way with the soft rounded surfaces between which it is set. This pointed member is called dart, or anchor, or tongue, according to its shape, and the name of the ornament is sometimes varied accordingly. Ornaments of this kind are found in Greek buildings of the Ionic style, dating from a time as early as the fourth century B.C. It is there varied from the plainest nearly egg-shaped rounds with mere ridges following their contour, and others as simple taking the place of the "darts" between, to a much more elaborate design in which the eggs are turned into leaves with midrib strongly marked, and the darts between modified in a like direction. They are also, even in the Erechtheion on the Acropolis, varied in size and placing, from the chief ornament of the cap moulding and several inches in height, to one of many horizontal parallel bands, each as small as allows of effective working of the ornament in marble. The ornament was taken as the single decoration of the Roman Doric capital; the ovolo so decorated is the chief characteristic of this order. — R. S.



Egg and Dart Moulding.

EGINHARD; abbot and architect.

Eginhard was director of the constructions of the Emperor Charlemagne (b. about 742; d. 814). He is supposed to have made the plan of the monastery of S. Gall (Switzerland), which is still preserved in the archives of the suppressed monastery.

Lenoir, *Architecture Monastique.*

EGINTON, FRANCIS; glass painter.

Eginton is called the reviver of glass painting in England in the eighteenth century. About fifty of his works are known. In 1794 he restored the great western window of Magdalen College, Oxford. He executed Sir Joshua Reynolds's Resurrection window at Salisbury Cathedral.

Redgrave. *Dictionary of Artists.*

EGL, ANDREAS; architect.

Bishop Leon Dundorfer laid the first stone of the cathedral of Ratisbon (Regensburg, Germany) in 1275. The chronicles mention as architects of the building Andreas Egl, Heinrich Zehnter, Heinrich Durnstetter, Friedrich Speiset, and Thomas Roritzer.

Bulau. *Les Trois âges de l'architecture gothique.*

EGLE, JOSEPH VON; architect; b. Nov. 23, 1818; d. March 5, 1899.

He was educated at the polytechnic schools of Stuttgart, Nuremberg, and Vienna, and attended (1839–1841) the Academy of Architecture in Berlin. In 1847 and 1848 he served as the correspondent of the *Allgemeine Bauzeitung* in North Germany, England, and Italy. He was made professor at the polytechnic school in Stuttgart in 1850, in 1857 was appointed *Hofbaumeister*, and in 1884 *Hofbaudirector* in Würtemberg (Germany). He built the Polytechnikum (1860–1865), remodelled the royal palace (1864–1867), built the Gothic Marienkirche and the new Catholic church, all in Stuttgart (Germany).

Nekrologie in *Kunstchronik*, March 6, 1899.

EGYPT, ARCHITECTURE OF. The most ancient works of monumental architecture are found in Egypt. At some unknown period — probably not less than five thousand years B.C. — Egypt appears to have been overrun by an Asiatic race bringing with them a material civilization already well developed, but of whose formative stages no vestige has yet been found. They founded in their new home a government which lasted until the Persian conquest by Cambyses in 525 B.C., under successive dynasties which have been found to correspond substantially with the thirty enumerated in the lists of Manetho (the last four of these being the Persian and three others coexistent with it). These dynasties form the basis of ancient Egyptian chronology. The oldest monuments are the royal tombs of the early dynasties, chief among them the pyramids, which were the work mainly of the 4th–6th dynasties. These prove the existence, forty centuries B.C., of a highly developed mechanical skill, of the use of metal, of a considerable knowledge of mathematics and natural science, and of an organized despotism. The territory occupied by this people was confined to the narrow valley of the Nile; which, except at the broad lowlands of the Delta, is hemmed in between rugged cliffs, at once isolating and protecting the empire. Early Egyptian art was thus almost untouched by foreign influences, but in later ages conquest and commerce carried its products to distant shores, where they powerfully affected the nascent arts of all the Mediterranean countries.

The history of Egyptian architecture falls naturally into three main divisions — the Ancient or Pagan, the Christian, and the Moslem. The Christian or Coptic period covers the centuries from the third to the seventh A.D.; the Pagan precedes, the Moslem follows it.

The Ancient or Pagan Period. This is customarily subdivided into the periods of (*a*) the Ancient or Mephite Empire (ten dynasties, circa 4500–3000 B.C.); (*b*) the Middle Empire, 11th–13th dynasties, reigning at Thebes from 3000–2100 B.C.; (*c*) the New Empire (or Second Theban), 18th–20th dynasties from 1700 to 1100 B.C. — the grand age of art and conquest; (*d*) the Decadence or Saitic period, 21st–26th dynasties at Sais, Tanis, and Bubastis; and (*e*) the Revival or Ptolemaic period, 323 B.C. to third century A.D., comprising the Macedonian and Roman dominion. The second and third of these periods are separated by the unproductive epoch of the Hyksos or Shepherd Kings — a rude invading race, perhaps Hittites. In the Decadence is included another sterile epoch, that of the Persian rule.

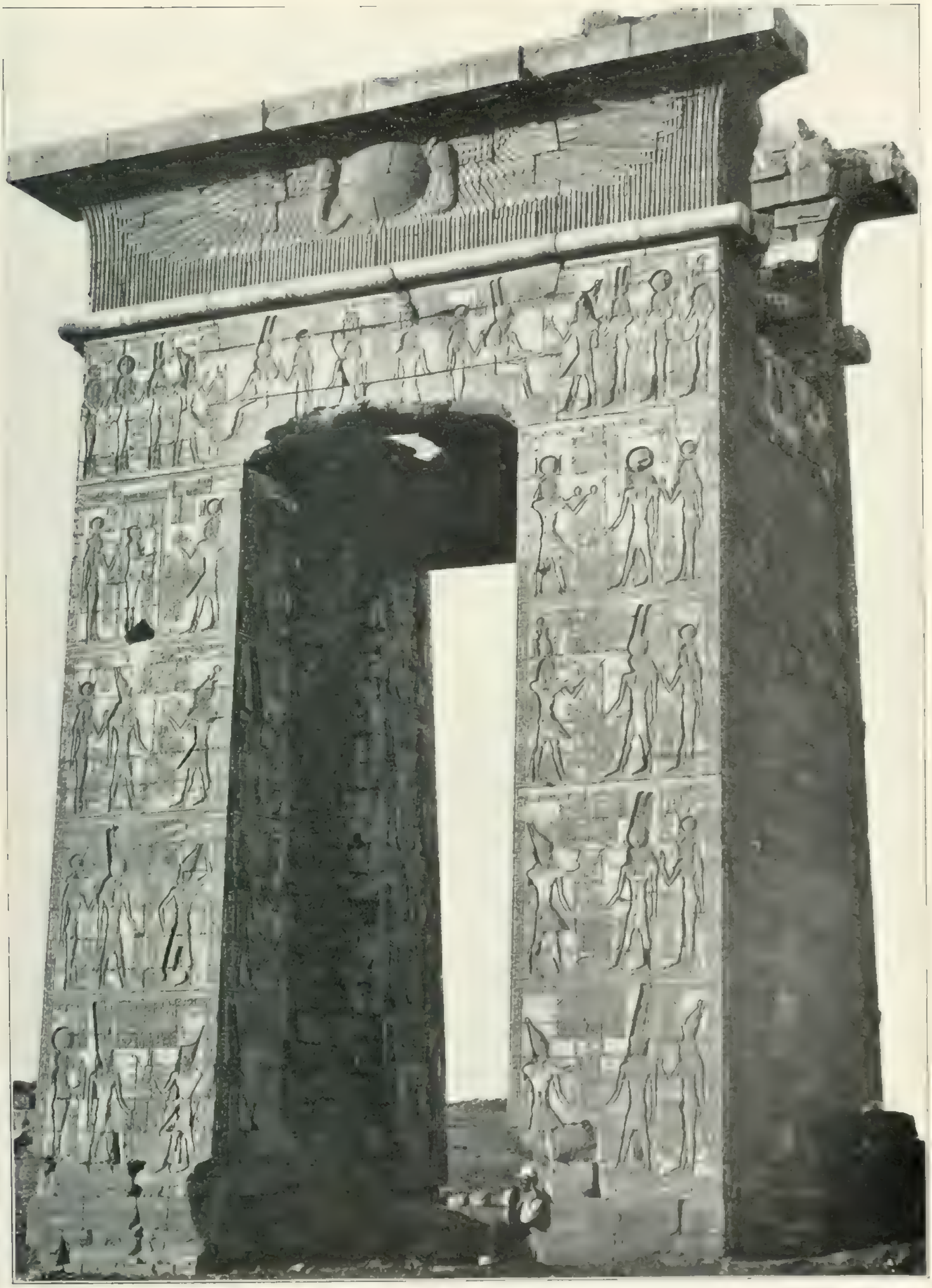
Each of these periods has its distinguishing architectural character. The extant works of the Ancient Empire are almost exclusively sepulchral; it was the age of pyramids and mastabas. In the Middle Empire the earliest of the nonsepulchral temples appear, and rock-cut tombs take the place of mastabas. The New Empire was the Great Age of Egyptian art; a period of extraordinary activity in war, commerce, and architecture, when rulers of consummate ability made illustrious the names of Thothmes, Amenophis, Seti, and Rameses by covering the land with stupendous temples and palaces, and excavated those extraordinary tunnel-tombs to which the Greeks gave the name of *syrinx* or pipe. The decline was marked by little else than weak imitations of earlier achievements; but with the Macedonian conquest there came a remarkable recrudescence of artistic productivity, to which we owe several of the best preserved temples in Egypt.

The *Ancient Empire* has left us little in the way of decorative architecture; but the structural skill displayed in the pyramids and mastabas, and their fine workmanship, raise them out of the category of mere building into that of architecture. Of the pyramids, — nearly one hundred in number between Abu-Roash and Meydûm, all of them royal tombs, accompanied originally each by its own sepulchral chapel or temple, — six are conspicuous for size or peculiar construction. That at Sakkarah, measuring 400 by 357 feet on the ground and 190 feet in height, is built in steps; while that at Meydûm, belonging to the 3d, or beginning of the 4th, dynasty, is formed of successive envelopes around a steep core standing on a broad base. The Dashour pyramid has two slopes, the lower part being steeper than the upper. The three largest at Ghizeh, erected, respectively, by Khufu, Khafra, and Menkhaura, of the 4th dynasty, are the best known, and the first two the largest in Egypt. That of Khufu ("Cheops") has a base of 764 feet square, and was originally 482 feet high; that of Khafra ("Chephren") is 454 feet high on a base of 717 feet; while the third (of Menkhaura, or "Mycerinus") is both steeper and smaller, being 213 feet high and 253 feet square. Each was originally revetted with polished granite, and that of Menkhaura still retains a considerable portion of this casing. The chambers and passages of all the pyramids have been explored in recent years, most of them having been, indeed, rifled long ago by the Arabs. Exact measurements and careful exploration have proved the sepulchral purpose of the pyramids, and disposed finally of all fantastic theories as to their origin and significance. They were carefully oriented, and the first two at Ghizeh so proportioned that the perimeter of the base closely approximates the circumference of a circle having the altitude of the pyramid for its radius. The workmanship is uneven; some of it is marvellous in accuracy and finish, while other portions are hastily and indifferently executed.

The mastabas were tombs of oblong plan with sloping sides and flat roofs, and contained a variety of chambers and passages, of which some were designed solely to mislead intending desecrators of the tomb. There were in all cases a chapel for funeral offerings; a serdab, or secret cell, for images of the defunct, by which the *ka*, or shadowy double of the soul, might preserve its identity of existence until released from the tomb to enter the underworld of the Sun of Night; and a well, or shaft, for the mummy. The greatest of these mastabas is that known as the Mastabat-el-Faraoun.

The only temples of this period so far discovered are remains of a few of the pyramid chapels, of which the most important is the so-called Sphinx Temple, belonging to the Khafra pyramid. It is T-shaped in plan, with massive walls, and aisles separated by plain square monolithic piers, once sustaining a roof of stone lintels, and is accompanied by various accessory chambers and a mummy well.

Middle Empire. The remains of this period are less imposing, but full of interest for their architectural forms. Fragments of a temple at Bubastis show the clustered lotus column, common also in the rock tombs of the period, and derived probably from prehistoric wooden prototypes. The rock tombs were chiefly cut in the west bank of the Nile; the most interesting are those of Beni-Hassan, adorned with open porches of rock-hewn columns and an antechamber, or chapel, besides



EGYPT, ARCHITECTURE OF

Karnak, among the ruins of ancient Thebes. Pylon of the time of Ramses II, covered with concavo convex reliefs which were once elaborately painted. Egyptian mural architecture, as contrasted with that which is mainly columnar, is well represented by this gateway.

the serdab tunnels and mummy cell, burrowing deep into the cliff. Some of the columns are quatrefoiled in plan, of the clustered lotus type; others, called *proto-Doric* from their superficial resemblance to the Greek Doric order, are plain polygonal piers with eight, sixteen, or more sides and a square abacus. There are also, at Abydos, a few structural tombs in the form of steep brick pyramids, each with a well-marked portal, but otherwise uninteresting. In all these various tombs, as also in those of the Ancient Empire, paintings and painted ornament, intended for the sole delectation of the *ka*, display great decorative skill and well-developed powers of artistic delineation, hedged and limited by hieratic traditions and fixed processes.

New Empire. The most impressive of Egyptian monuments aside from the pyramids are the temples of the New Empire, especially of the 18th and 19th dynasties. During this remarkable period of conquest and of architectural activity, successive monarchs laboured in the erection of a series of temples of a size and splendour previously unattempted, and of the most extraordinary massiveness and solidity of construction. Some of these were sepulchral temples, though not adjacent to the royal tombs; such was the Amenopheum, of which there remain only two colossal portal statues on the Theban plain — one of them the famous "vocal Memnon" of antiquity. Such was the magnificent mausoleum of Queen Hatasu, at Deir-el-Bahari; the Ramesseum, near by to the southwest; and the temple of Rameses III., at Medinet Abu. These did not differ essentially in plan from other temples, varying only in scale and details. The general type, represented on a colossal scale by the temples of Karnak and Luxor, persisted unchanged through the whole history of ancient Egyptian art. Its most remarkable exemplifications under the New Empire were the Ramesseum, the temples of Medinet Abu, Abydos, and Gurneh, the little temple of Khonsu at Karnak, and the colossal temples of Luxor and Karnak. The latter, the most colossal of religious edifices, was begun during the Middle Empire by Usurtesen III., and continued by succeeding dynasties till the time of Evergetes II. of the Ptolemies. It is too complicated and peculiar in some of its arrangements to serve as an absolute type, but conforms substantially to the general scheme in spite of these peculiarities.

The essentials of this type were a sanctuary, or sekos, the first portion to be built, and the smallest, lowest, and darkest part of the whole, comprising a small chamber with a number of accessory rooms, cells, and passages for the priests; a hypostyle, or columnar hall, usually open at the front, and architecturally the most elaborate feature of the temple; and one or more forecourts, each preceded by a gateway flanked by pylons. These last were truncated pyramidal masses capped by flaring cornices, decorated externally with masts for banners, with obelisks, and with colossal seated statues, and often, also, with huge pictures incised and painted, recording the great deeds of the royal builder. A plain, unpierced stone wall surrounded the whole, and sometimes a second wall of brick, enclosing a larger area. The entrance through these walls was by pylon-flanked gateways, the approach to which was an avenue bordered on either hand by colossal sphinxes. The courts were adorned on one or more sides by colonnades, and served to hold the crowds who were not privileged to enter the hypostyle hall; only the king and higher priests were admitted to the sekos. The court, hall, and sekos were the essential features of the plan, and can be recognized in the rock-cut temples of Abu Simbel and in the tiny temple at Dandour (Nubia), as well as in the half-structural, half-cave temples at Deir-el-Bahari, Gherf Hossein, etc.

In the structural temples the arch was ignored; the wall, pier, or column, and lintel were the only structural elements admitted, and the lintels were all of stone. The columns were not monolithic, but built up of many pieces, and were often of colossal size. There were no "orders"; but, in spite of great variety in details, the columns are easily divisible into a few general types, such as the single and the clustered lotus-bud, the campaniform, the palm-capped, and the Hathor-headed. The lintels were invariably plain, and the only cornice was the flaring cavetto-cornice, with sometimes a cresting of *uræi* or serpents. No mouldings were used except a kind of torus, and carved architectural ornament can hardly be said to have existed except in the capitals of the columns, flutings on the cavetto-cornice, and the winged globe or disk over each gateway. Decoration was effected chiefly by paintings, either symbolic or pictorial, with incised outlines or forms in low relief, and by a decorative use of hieroglyphics. Conventional ornament was chiefly confined to the industrial arts, or to the adornment of tomb interiors; it was largely based on lotus forms; but other flowers as well as the papyrus and purely conventional forms figure in it, treated usually with great decorative propriety.

This solemn and massive architecture is marked by the qualities of simplicity, repose, grandeur of scale, and a certain sublimity of general effect. Even in ruins the temples of Karnak, Luxor, Abydos, Medinet Abu, and the Ramesseum, produce an extraordinary impression of majesty and grandeur.

Ptolemaic Period. The later temples, erected during the Ptolemaic and Roman rule, rival those of the Great Age in splendour, and a few of them, as at Philæ, are temple groups of the first magnitude. The splendid [illegible] donian rulers revived Egyptian architecture with no admixture of Greek details, but with great richness in the capitals and applied decoration. An innovation characteristic of the period was the insertion of screen walls between the columns of the front row of the hypostyle hall, as at Edfu, Denderah, and Philæ. The simple lotus-bud column was generally abandoned for those with floral or palm capitals, or quadruple Hathoric masks, and the pictures and hieroglyphics were disposed on the walls with more regard to scale and decorative effect than formerly. The temples of Denderah (time of Cleopatra) and of Edfu are especially well preserved examples from this period, but the most imposing and picturesque group is that on the island of Philæ near the second cataract, with a temple of Isis, long and ornate colonnades, and two small peripteral temples, one dating from the time of Nectanebo, the other Ptolemaic. At Esneh, Dakkeh, Kalabshé, and Kardassy (Gher-tashi) are others of less importance in the same general style.

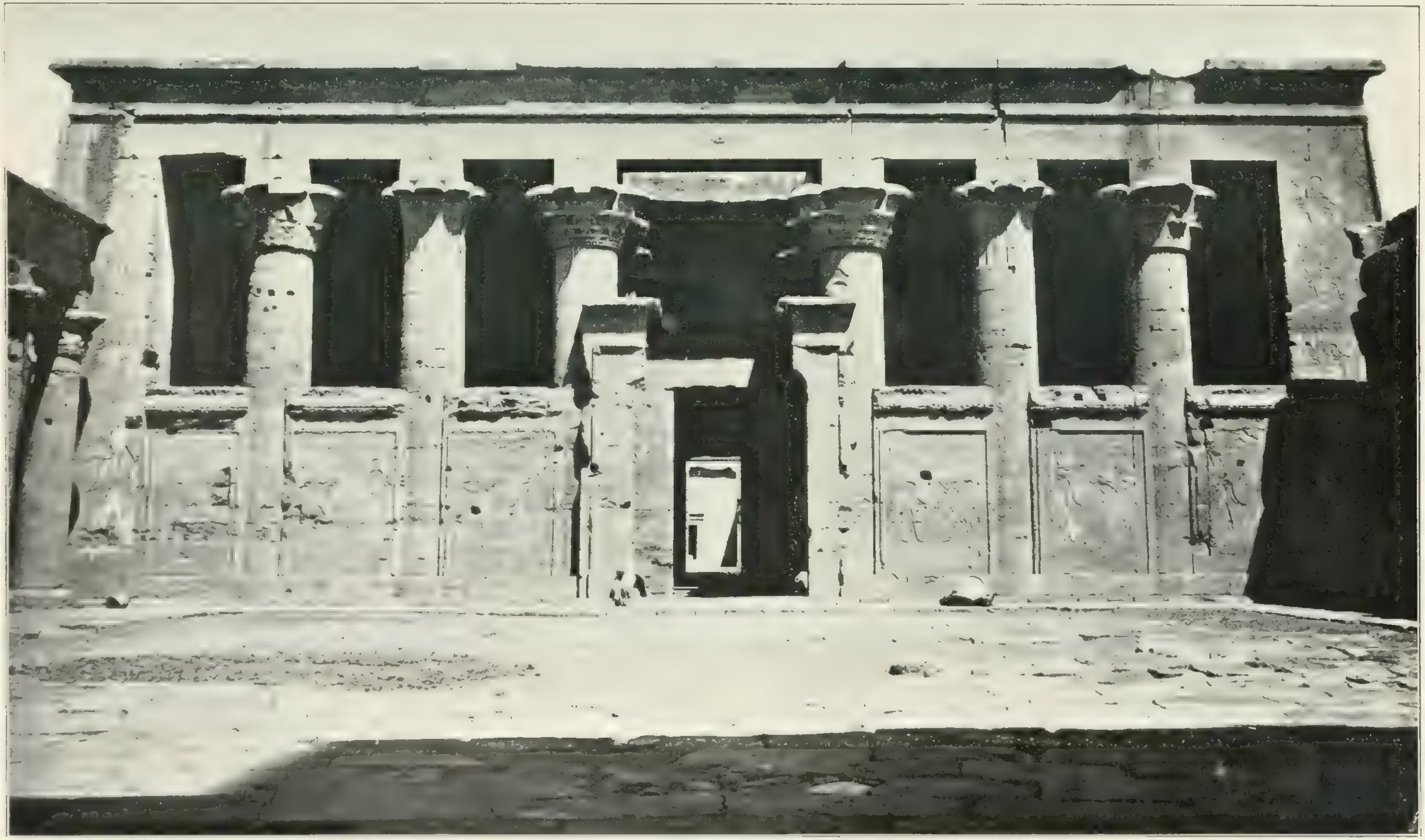
Besides temples of the common type there were also numerous small temples or shrines entirely open externally, and others built with piers or columns around a small chamber for special religious or ceremonial purposes, *e.g.* the mammeisi, supposed to serve for the rites attending childbirth. Besides the two at Philæ mentioned above, there are other examples at Edfu, Elephantine, and Medinet Abu. Of secular, military, and domestic architecture there are few remains of importance: at Medinet Abu the ruins of a pavilion of Amenophis III.; at Semneh in Nubia, of an ancient fortress of the time of Usurtesen III.; and scattered remains of granaries, forts, and other buildings. Pictures and reliefs in tombs and temples indicate the frequent use of wood for houses, and a style of domestic architecture very simple and unostentatious externally.

The Coptic Period. The majestic temple architecture of Egypt expired during the Roman dominion, and Egypt fell into decay, from which it did not revive until the Arab conquest in 638 A.D. During this long period of atrophy the only architectural activity was that of the Coptic Christians, who covered the country with churches and convents during the fourth, fifth, and sixth centuries of our era. The Copts, whose name is a corruption of the Greek word for Egypt, remain to this day as a survival of the higher castes of the ancient Egyptians, as the *fellahin* do of the ancient serfs. Having espoused with fervour the Monophysite heresy, they were intensely hostile to Byzantine influences of every kind, and worked out a style of their own which completely ignored alike the ancient Egyptian traditions of form and the contemporary Byzantine practice, but profoundly influenced the art of the conquering Arabs in later centuries. The sweeping destruction of these early churches and monasteries by the Moslems has left us only scanty traces of this architecture; but it was probably fairly represented in the earliest mosques, like that of Amru at Cairo, since these were built by Copts, presumably in their own prevailing style. The plan of the early churches, like that of these mosques, was suggested by the forecourt and hypostyle hall of the great temples, and comprised an atrium surrounded by arcades and a hall beyond, in which arcades likewise replaced the colonnades of the temples. The ceilings were of wood, the buildings low and insignificant. A small sanctuary at the centre of the farther side of the hall was vaulted or domed, and the arches were generally pointed. These early pointed arches the Copts introduced into the mosques which they built for the Arab conquerors, where they served as a type for the arches of all the later Moslem buildings. In other words, it is to the Copts that architecture owes the earliest systematic introduction of the pointed arch, though reinvented later by the mediæval church builders of the West.

The later Coptic churches, including nearly all those now extant, were basilican in plan, three-aisled, with a domical sanctuary, and galleries, small in size and sadly wanting in architectural beauty; their internal effect is further injured by the transverse screens which divide the men from the women, and they possess little decorative detail of interest. It required the wealth and power of the conquerors to bring into full play, in the mosques, the artistic capabilities of the Copts, especially in the decorative treatment of surfaces.

The Mohammedan Period. The general history and principles of Mohammedan architecture are given under that title; the present notice is concerned with those features and monuments peculiar to Cairo. For Cairo, including Fostat and the neighbourhood, contains practically all that is important in Egyptian Moslem architecture.

This style was, for several centuries after the conquest by Amru, in 638 A.D., in reality but a variant of the Coptic. All the mosques erected previous to the Baharite Sultans (1250) were alike in general plan, having a courtyard surrounded on three sides by single or double arcades (liwâns), and with the fountain of ablutions (hanefiyeh) in the centre. The fourth side was closed by the mosque proper, the prayer-room or maksourah, a low hall consisting of several transverse aisles separated by arcades on piers or columns, open at the front to the court, and provided on the farther side — always to the eastward — with one or more niches (mihrab), indicating the *kibleh* or direction of Mecca, toward which every Moslem prays. The whole edifice, including the court, was often surrounded by a second or exterior circuit wall, pierced by



EGYPT, ARCHITECTURE OF

Temple of Horus, at Edfu; the colonnade and screen dividing the hypostyle hall (which, in this picture, is in complete darkness through contrast to the sunlight on the sand-stone walls) from the great outer court. On the left is seen another column of the peristyle surrounding the great court. Through the doorway in the middle is seen the farther doorway leading to another hall with columns which forms the first part of the temple proper. The whole of this structure is in its present condition a rebuilding or an elaborate restoration of the time of the Ptolemaic dynasty. Great pains were taken to preserve the ancient character

one or more gates. Such were the mosques of Amru (642), of whose original structure hardly a trace remains, though its plan survives in the present ruinous mosque of that name; of Ibn Tulûn (876), in which the Coptic architect dispensed with columns by the use of brick piers with engaged shafts moulded at the corners; the Gama-el-Azhar (969), by the Moghrebi (Moorish) conqueror, El-Moezz, now a university; the mosque erected by his grandson, El-Hakim; the Gama'n-Noureh (996), and others of later date. In all of these the Coptic pointed arch was used; the ceilings were of wood, richly painted; inscriptions in Cufic characters formed borders and friezes in the sumptuous wall decoration of incrusted marble inlay; and geometric interlacings, polygonal and star panellings, and a peculiar form of running scroll characterized the ornamentation of the interiors. Some of the mosques were of great size; the court of Ibn Tulûn is 300 feet square. Under the Fatimite dynasty of El Moezz (969) the vault and dome first begin to appear in mosques and tombs by Coptic architects, influenced no doubt by Byzantine models in other parts of the Moslem world, or by Persian buildings which have not survived to our time. The dome was long confined to sepulchral buildings; it was at first given an ovoid section, which became pointed under the Baharite Sultans; and was erected upon a square plan by means, not of spherical pendentives, but of a complex system of corbels and niches of stalactite work. These domes were richly carved externally, and are the earliest examples of the dome used as an external decorative feature. Internally, the preoccupation of the Coptic architect was to produce an impression, overhead, of mystery and gloom, rather than of space and breadth; the upper part of the dome was dark, its decoration intricate and perplexing. In this period the minaret also came into use, and during the next three centuries was developed into an architectural feature of great elegance. Square or octagonal in plan, built in two or three diminishing stages, marked by external galleries, carried on rich stalactite corbelling, it was made highly ornate in every part.

All these tendencies were emphasized under the Ayûb dynasty (1160–1250) and the Mameluke Sultans of the Baharite (1250–1376) and Borgite (1376–1517) lines: a period which coincides closely with that of the Gothic styles in Western Europe, and is characterized by a similar progression in the direction of lightness, loftiness, splendour of decoration, and elaboration of plan. Many of the mosques, like the great monasteries of Christendom, comprised whole groups of buildings for hospitals, schools, and similar purposes, and a still larger number include the founder's tomb or turbeh. The dome was at first confined to the sepulchral chamber, but was later used also over the prayer room. Stalactite decoration became more elaborate, star panelling more involved, the minarets more slender and ornate. The entrance doorway was enclosed in a lofty rectangle extending to or above the top of the exterior wall and chiefly occupied by a colossal stalactite-headed niche bordered by arabesques. The hospital-mosque or Maristan of Kalaûn dates from 1284–1305; that of El Medany, from 1332; of Sultan Hassan, with four barrel-vaulted chambers opening upon the court or sahn, like the arms of a cross, to form the liwans and sanctuary, with the Sultan's domical tomb beyond the latter (1379). Other important mosques are El Barkûk (by the founder of the Borgite line), with two domical turbeh (tombs) at the ends of the wooden-roofed sanctuary (1384); El Muayyad (1412); the tomb-mosque of Kaid Bey in the Karafah (1470–1480), one of the richest of all those in Cairo in its internal as well as external decoration, its pavements, and its minaret. Another mosque by the same Sultan near Ibn Tulûn is on a similar plan, but now very ruinous. The last of the Mamelukes, Ghouri, also built a mosque which bears his name and is one of the last of the purely Arab mosques (circa 1513). In 1517 Egypt became a Turkish province under Selim I., and the later mosques are generally in the Turkish style, based on Byzantine precedents, *e.g.* Sinan Pasha mosque in the Bulak suburb (1571), with broad low dome on octagonal drum, and a domical-vaulted vestibule enclosing three sides of the sanctuary like that of S. Mark's at Venice. The great mosque of the usurper Mohammed Ali in the citadel (1815–1821), an imitation of the Yeni Djami at Constantinople, though uninteresting in detail, is internally impressive by its spaciousness, loftiness, and lavish use of alabaster and painted tiles.

In general the Egyptian Moslem architecture is important rather on the decorative than on the structural side, although it presents in its domes, minarets, and stalactites, and in the interlocking voussoirs of many of its arches, much structural ingenuity and skill. It is most successful, however, in the masterly use of intricate and perplexing geometrical combinations, expressed in strong colours, covering interior and exterior alike with elaborate ornament so composed and distributed as not in any way to destroy the larger lines and effects of the building. Stained glass, set in patterns perforated in hard plaster, was used with excellent effect in windows of moderate size; rich marble was employed in pavements and on walls in various forms of mosaic and inlay; and the mambars or high pulpits next the mihrab, the doors, the mosque lanterns, and other accessories were extremely well designed and well executed.

Of the great mediaeval palaces of Cairo there is little or nothing left, though the accounts of them in the Arab histories read like fables in the descriptions of their splendour and extent. The modern houses are picturesque, built usually with a central court on which opens a large reception hall with a diwân (divan) on one side, while the other three give access to the various living rooms. The *meshrebeeyeh* or projecting oriel windows, enclosed by lattice screens of turned work, which occupy a large part of the upper stories of the street fronts, are elaborate and beautiful features of the street architecture. (See Moslem Architecture; Mosque.)

For ancient Egyptian architecture consult Perrot and Chipiez, *History of Ancient Art in Egypt* (the French original should be used, if practicable), and the various works of Maspéro, especially his *Archéologie Egyptienne*, a small book well translated by Miss Edwards, with additional notes. All the works of Mariette, Brugsch Bey (*Egypt under the Pharaohs* — a translation by Broderick), and Flinders Petrie, especially his *History of Egypt*, which gives singularly well the true significance of the monuments; also the plates of Jomard's *Description de l'Égypte, Antiquités*. On Coptic Egypt, Butler, *The Coptic Churches of Egypt*. On Egypto-Moslem architecture, Bourgoin, *Les Arts Arabes*; Franz Pasha, *Die Baukunst des Islams* (in the Darmstadt *Handbuch der Architektur*); Gayet, *L'Art Arabe*; Prisse d'Avennes, *L'Art Arabe*; Texier, *Monuments Arabes du Caire*. The magnificent plates of Prisse d'Avennes (*Art Égyptien* and *Art Arabe*) are of undisputéd excellence, but the text has never been completely developed into a treatise.

— A. D. F. HAMLIN.

EGYPTIAN BRECCIA. Same as Egyptian Breccia Marble, under Marble.

EIGTVED, NIKOLAI; architect; b. June 22, 1701; d. June 7, 1754.

Eigtved began as a gardener in Germany. In 1729 he served in the Saxon army as lieutenant of engineers. In 1732 he was sent by Christian VI. of Denmark (d. 1746), to study architecture in Italy. On his return he was made court architect, inspector of the Academy at Copenhagen (1745), and finally director of the Academy (1751). He built the palace of the crown prince (1745), the four palaces of the Amalienborg place, the old Royal Theatre, the palaces of Christianborg, Fredensborg, Sophienberg, and Bregentved. Eigtved began the "Marble Church" at Copenhagen, which was continued by Nicolas Henry Jardin (see Jardin, N. H.).

Weilbach, *Nyt Dansk Kunstnerlexicon*; Neckelmann, *Renaissance in Dänemark: Blätter für Architek und Kunsthandwerk*, 1895.

EINHART; architect, painter, sculptor, and statesman.

He came to the school of the monastery of Fulda in Germany in his youth, and was later attached to the court of Charlemagne (b. 742; d. 814) as general superintendent of the imperial buildings. He built the palace at Aix-la-Chapelle (Aachen), Germany, of which the chapel remains and has given its name to the town.

R. Dohme, *Einhart u. Dohme Series*.

ELÆOTHESIUM. An anointing room in a bathing establishment (Vitruvius, V., 11). (See Unctorium.)

EL-AKSA. (In Arabic, "The Far" or "The Distant," probably referring to its marking a remote part of what was then the Mohammedan empire.) A mosque at Jerusalem; it is thought to be the oldest Mohammedan place of worship next to the one at Mecca; and yet it appears that much of the structure is Byzantine, and it is thought that this work belonged to a basilica built by Justinian.

ELASTICITY. *A*. The power possessed by solid bodies of regaining their form after deformation which has not been so great as to overpass their limit of elasticity. When an ivory ball rebounds after falling on a hard surface it is because the ball seeks to regain its perfectly spherical shape, and the surface, as of a billiard table, also seeks to return from the compression which it has undergone under the blow. Ivory has much elasticity, marble somewhat less; many stones are very elastic, those which are the hardest, the most so as a general thing; but wood is of limited elasticity, and a bar of it is rather easily bent in such a way that it will remain bent, different woods differing greatly in this respect. On the other hand it has some, and notable instances of this may be named; thus, two heavy beams of hard pine supported a floor of artificial stone, and when the material of the flooring was still wet, yielded under its weight nearly 2¾ inches in the middle; but returned to an apparently perfect level as the floor dried, thus lifting the whole weight of this floor by their elasticity. Iron beams have much elasticity, as is evident from the peculiar vibration which a floor composed of them so frequently undergoes.

B. By extension, and inaccurately, flexibility or the power of adapting itself to irregular pressures and strains, said of a building or part of a building. It is customary to say of the Gothic construction, that it is elastic; by which is meant that it is capable of yielding a little without showing dangerous cracks, or without risking its solidity and permanence. There is also conveyed in this descriptive term an idea of that resistance of force by force which is peculiar to Gothic building. In this, the thrust of one arch is taken up or neutralized by the thrust of another arch, and so on until the last arch of a series thrusts against a flying buttress, which transmits the thrust finally to a solid and passive mass of masonry, the outer buttress, or to the foundations or the ground. In Roman Imperial and some other arcuated styles, there is little of this neutralization of one active force by another, but all arches have their thrust taken up by solid masses of masonry.

— R. S.

ELASTIC LIMIT. The limit of stress up to which the material takes no permanent deformation, or from which, being stretched or bent, it returns to its original form when the stress is removed. —W. R. H.

ELBOW (I.). An appliance upon which the elbow, as of a sitting person, may rest; an arm rest of a choir stall or pew.

ELBOW (II.). In general, any relatively small piece or part of a structure bent or formed to an angle, as a pipe, an angle formed by two surfaces, or the like. Specifically: —

A. In English usage, (1) a short return or sharp angular change of direction for a short distance, in a wall, as for a recess; (2) in joinery, that portion of the jamb of a recessed window between the floor and bottom of the shutter boxing.

B. A piece of pipe formed either by a curve or by a mitre joint to connect two sections of pipe at an angle.

C. The ear or projecting portion of a crossette to a door — or window — architrave. (Rare.) — R. S.

ELBOW BOARD; RAIL. A board or strip forming the inner sill of a window trim, or secured to a wall or screen at about the height of an arm rest.

ELEANOR CROSS. (See Cross of Queen Eleanor.)

ELECTRICAL APPLIANCES. The fixtures and appointments necessary to electrical work in buildings, or which are used when needed. After the article Wiring, the other terms are arranged alphabetically. (See also, under their different headings, Candle Power; Lightning Rod; and the general terms Annunciator; Elevator; Lighting; Warming.)

ALPHABETICAL LIST OF ELECTRICAL APPLIANCES

1. Wiring.
2. Alarm.
3. Arc Lamp.
4. Attachment Plug.
5. Battery.
6. Bell.
7. Burglar Alarm.
8. Buzzer.
9. Circuit.
10. Circuit Breaker.
11. Cleat.
12. Clock, Electric.
13. Conduit.
14. Cut-out, Fusible.
15. Door Opener.
16. Drip Loop.
17. Dynamo.
18. Extension Bell.
19. Fixture, Combination.
20. Flexible Cord.
21. Gas Lighting.
22. Hanger Board.
23. Incandescent Lamp.
24. Insulating Joint.
25. Insulating Tubes.
26. Insulator.
27. Junction Box.
28. Magnet.
29. Meter, Electric.
30. Moulding.
31. Netting for Arc Globes.
32. Pump, Electric.
33. Push Button.
34. Rosette, or Ceiling Block.
35. Shell, Electric Light Fixture.
36. Socket, Incandescent Lamp.
37. Spark Arrester.
38. Storage Battery.
39. Switch.
40. Switch Board.
41. Telephone.
42. Temperature Regulator.
43. Thermostat.
44. Transformer.
45. Vapor-tight Globe.
46. Voltaic Cell.
47. Watchman's Register.

1. *Wiring*. Considered broadly, the electric wiring in a building is the system of conductors and auxiliary appliances provided for the conduction and control of the electric current, so that it may be properly carried from the generating plant to the lamps, motors, or other appliances where the electrical energy is used.

Copper is used for the conductors because it has the least resistance of any of the cheaper metals. It has a certain amount of resistance, however, depending upon the size of the wire, and it is necessary with all installations to take into account the strength of the currents in the different parts of the system and the distances the currents have to travel, so that neither the energy required to force the currents through the wires, nor the cost of the copper, will be excessive. The loss of energy in the wiring is serious, not only on the score of economy, but on account of the effect on the electrical pressure. When lights are operated on the multiple system (see Lighting, Electric), the pressure should be approximately the same at the terminals of each lamp; but when energy is used in overcoming the resistance of the wires, a part of the pressure is thus lost, and the lamps give less light. Where the wiring is carelessly calculated, it may happen that lamps in different parts of the system will be giving widely different amounts of light.

Besides providing conducting paths for the current, these paths must be insulated, so that the electricity will not leak back by side paths where it will not be useful. Plaster, brickwork, and damp material of many kinds, as well as metals, offer fairly good paths for the current, so that it is necessary to support the conducting wires on porcelain or glass, which are nearly perfect insulators, or else cover the wire with a substantial rubber insulating covering, and then run the covered wire in tubes for protection. All wires in buildings have an insulating covering, but this is not depended upon exclusively unless it is protected from abrasion.

Since an electric current in passing through a short air space causes an electric arc with its intense heat, and since electric currents too large for the conductors carrying them often produce a great amount of heat, it is necessary to take precautions so that this heating will not occur accidentally and set fire to surrounding material. Much attention has been given to the question of safe electrical construction, and experience has developed methods now clearly appreciated and followed by all competent workmen. The rules for safe wiring are laid down in detail in what is known as the National Electrical Code. This code of rules has had a gradual growth. Beginning with comparatively few requirements, it has been extended and enlarged as the experience of the electric companies and the insurance companies has brought out more clearly the precautions that are necessary for good and safe service. In its present form, the code has been approved and adopted by the American Institute of Architects, American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Street Railway Association, Factory Mutual Fire Insurance Companies, National Association of Fire Engineers, National Board of Fire Underwriters, National Electric Light Association, and Underwriters' National Electric Association.

The principles underlying good wiring construction are simple, but their application to all conditions leads to great detail. In general, the rules have been designed to prevent destructive arcs and excessive current, to keep the effects of these accidents local if they happen, and to make it easy to repair defects.

All wiring for incandescent lighting, and consequently much the greater part of the wiring in buildings, is for use with the low pressure multiple system. With this system, service wires enter the building from the generating plant, mains are connected to these service wires, branches run from the mains, and taps to the lamps run from the branches. Wherever the size of wire changes, cut-outs containing fusible strips of metal are inserted, and these strips melt and break the circuit if the current becomes too large for the wire to carry safely. Switches can be inserted at any parts of the system to cut out a small or large number of lamps or other appliances. The wires may be run on non-combustible insulators, or, if not in concealed spaces, may be run in moulding. Where wiring is concealed, much the best method is to run the wires in conduit. For this, the building is first fitted with a system of tubes or pipes, now commonly made of wrought iron. These tubes are laid under the plaster, and lead the service wires to the mains, the mains to the branches, the branches to the taps, and thence to the lamps, and wherever wires are to be connected to other wires, a junction box is provided. The insulated wires are drawn through these tubes, and the necessary connections made. The tubes are not depended upon for insulation, but are simply raceways for the wires, protecting their insulating covering from injury, and affording a confined channel through which a wire may, at any time, be withdrawn and replaced by another.

With electric bell circuits and others of this class operated with low electric pressures, the highest grade of electrical construction is not a necessity, but good construction assures so much better service that even with this class of work the standard of wiring construction is becoming very much like the better grade of electric light wiring.

2. *Alarm.* A device operated by electricity that attracts attention upon the occurrence of certain events or conditions. An alarm can be given by the presence of a person at some definite place, the opening of a door or window, a change in the temperature of a room, or, in fact, any event or condition that can cause two conductors of electricity either to come together or to separate, or that can cause appropriate movement between a magnet and a coil of wire. An alarm system ordinarily consists essentially of an electric bell which sounds the alarm, a battery or other source of electric current supply, and devices at the points where events or conditions occur that either close or open the electric circuit, and set the alarm in operation. The various parts of the system are connected by insulated wires run in the walls, or in grooves in the floors. Alarm systems differ in detail and complexity according to the uses to which they are put. (See below, Bell; Burglar Alarm.)

3. *Arc Lamp.* An electric lamp making use of the fact that an electric current passing through a small space between two conductors, such as carbon pencils, causes extremely intense light, which is in the form of an arc between the conductors. Intense heat is also generated, and the conductors are gradually consumed. For many reasons, carbon pencils are always the conductors used, and they are placed in the lamp vertically, point to point. If the carbon points come together, the light is extinguished; and if the points burn away and leave a wide space, the arc becomes "flaming," and is destructive to the carbons and parts of the lamp. The mechanism of the lamp consequently has for its object the maintaining of the arc at a proper length for the best result. The lamp consists of the mechanism for this regulation, carbons held point to point by clamps, a glass globe surrounding the light, and a metal frame supporting the parts. Double carbon lamps have two sets of carbons, and the mechanism is such that when one set of carbons has become too short for further use, the other set is automatically connected into the circuit.

4. *Attachment Plug.* An appliance to be inserted into an incandescent electric lamp socket in place of a lamp, or in a special socket flush with the wall, and so arranged that flexible conductors may be attached. Attachment plugs are used when it is wished to provide a portable lamp or other movable appliance. The portable lamp or other movable appliance is attached to a flexible cord of sufficient length, and the other end of the cord is connected to the attachment plug, which is inserted in any convenient wall or fixture socket.

5. *Battery.* A group of independent sources of electricity so connected that they act together with cumulative effect. The term as used ordinarily refers to a group of voltaic cells. A single cell is commonly but incorrectly spoken of as a battery.

Batteries of voltaic cells are the usual sources of electric currents for bells, alarms, and other similar household appliances. (See Voltaic Cell, below.)

6. *Bell.* Electric bell systems consist of the bell, a battery which furnishes the electric current, push buttons or other devices for closing the circuit, and insulated wires connecting the different parts of the system. Where a bell may be rung from several different places, an annunciator is used to indicate the place from which a signal has come. An electric bell is sounded by the striking of a clapper actuated by an electro-magnet or by mechanism set in operation by a magnet. In the ordinary form, where the clapper has the characteristic rapid vibration, the armature of the magnet is arranged so that it will open and close the electric circuit. A light spring tends to keep the armature away from the magnet, but the magnet, when the current is passing, is strong enough to move the armature. The armature closes the circuit when it is away from the magnet and opens the circuit when it approaches the magnet, so that it is subjected alternately to the pull of the magnet and the pull of the spring. The armature and the attached clapper thus maintain a continuous vibration as long as any push button keeps the circuit active. When it is wished to have less sound than a bell gives, the bell proper is omitted and the clapper or magnet armature simply vibrates rapidly, giving a buzzing sound that can be somewhat increased by making the enclosing case resonant. This arrangement is called a buzzer. The electric bell system in large buildings, such as hotels, is often elaborate. With the return call system there is a bell in each room, in addition to the general bell in the office, for instance, so that from either a room or the office a response to a signal may be returned. An appliance is also provided by means of which the bells in all the rooms may be sounded in case of fire. Special arrangements can be made in the mechanism of the signalling apparatus and the annunciator that make it possible to send a number of different signals, as in the so-called "teleseme" system. Electric bells are sometimes operated by clockwork mechanism, the electric current, in connection with an electro-magnet, serving simply to release a catch and thus allow the clockwork to sound the bell. This method is used with gongs where a considerable amount of power is required.

7. *Burglar Alarm.* An electric alarm that is sounded when a window is raised or a drawer or door is opened, or when a person walks over certain parts of floor or stairways. As with ordinary electric alarms, the burglar alarm system consists essentially of an electric bell, a battery, devices for closing the electric circuit, and insulated electric wires connecting the different parts. The devices at windows, doors, etc., consist of metal contact-pieces that are held apart when the window or door is closed. If the door or window is opened slightly the contact-pieces come together, close the electric circuit, and cause the ringing of the bell. The contact-pieces may be arranged to allow the opening of windows at the top or a little at the bottom, for ventilation. On floors or on stairways mats are used in which there are contact-pieces that are brought together by the weight of a person. The alarm bell may be placed in a room in the building, or may be in a distant building, such as a police station. Usually the circuit closed by the contact-pieces operates so that the battery becomes directly connected to the bell and rings it continuously till disconnected by a switch at the bell, even though a window or door that has been opened is closed again. In connection with the bell is an annunciator which indicates the point from which the alarm signal has come. The apparatus is also usually supplied with arrangements by which the whole system, or any parts, may be cut out of service, and often there is also a clock that can be set to cut out the whole system, or any part, for any length of time, beginning at any hour.

8. *Buzzer.* (See Bell, under Electrical Appliances, 6.)

9. *Circuit.* The loop of conducting material forming the path for an electric current. Electric currents as ordinarily dealt with move only in closed loops. The circuit is broken and the current stopped when the continuity of this loop is broken at any point.

10. *Circuit Breaker.* The name given to a number of different appliances, all of which, in one way or another, make a break in an electric circuit or maintain a break. The term is most commonly applied to a piece of apparatus that is virtually an automatic switch. In its normal position, metal pieces are held in contact and the current flows uninterruptedly through the breaker. When the current rises beyond a predetermined strength an electro-magnet attracts its armature, which releases a catch, and a spring or weight is then free to force the metal pieces apart and thus interrupt the circuit.

11. *Cleat.* A short strip of insulating material (usually porcelain) employed in fastening electric wires to ceilings or walls. A cleat is made ordinarily of two parts, one serving to keep the wire away from the ceiling or wall, and the other serving as a binding strip. The wire is clamped between them and held firmly when screws are run through both parts into the ceiling or other support.

12. *Clock.* A clock that is either wound, operated, or simply controlled by electricity. Electric clocks consist ordinarily of only the face and hands and a small amount of mechan-

ism by which the hands may be advanced each minute by the passage of a momentary electric current. Such clocks are controlled by a master clock in an observatory or other place where it can be kept correct. Each minute an electric contact is made and a momentary electric current passes through wires to each of a number of clocks, where small electro-magnets cause the hands to move in accordance with the correct master clock.

13. *Conduit.* Tubing provided for the enclosure of electric wires. Conduit, in buildings, is usually spoken of as interior conduit. It is sometimes of insulating material, sometimes of bare metal, and sometimes of metal lined with insulating material. Where wires are run in conduit the tubes compose a general system which is completed before the wires are drawn in. (See Wiring, above.)

14. *Cut-out, Fusible.* An electric protective device employing a wire or strip of fusible metal which is melted by the passage of excessive current and the circuit thus interrupted. The wire or strip of fusible metal is commonly called a fuse. The complete cut-out consists ordinarily of a small porcelain box in which there are brass connection pieces for the attachment of the circuit wires and the fuses. The connections are arranged so that the current passes through the fusible strip when the strip is intact, and the melting of the strip thus introduces a break in the circuit.

15. *Door Opener.* A device for moving the latch of a door from a distance by means of electricity. The ordinary form consists of a latch specially made for this purpose containing a bolt moved by an electro-magnet. Wires from the magnet lead to the place or places from which the door is to be opened, and push buttons at these places close the electric circuit and allow a battery to send a current round the coils of the magnet.

16. *Drip Loop.* A loop made in an electric wire at the point where it enters a building. The wire is bent down so that the lowest part of the loop will be below the point of entrance to the building, and accumulated moisture will then drip from the wire instead of running into the hole through which the wire enters. Moisture about the wire where it touches other substances makes leakage of the current more probable.

17. *Dynamo.* A machine for transforming mechanical energy into electrical energy, or electrical energy into mechanical energy. A machine that receives mechanical energy at its pulley and delivers electrical energy is called a generator; one that receives electrical energy and delivers mechanical energy at its pulley is called a motor. The generator depends for its action upon the fact that when a wire is moved past a magnet pole an electric pressure is set up in the wire, and this results in a current if the wire is in the form of a closed loop. The motor depends for its action on the fact that if a current of electricity is forced through a wire that is near a magnet the wire will tend to move either toward or away from the magnet according to the direction of the current. Dynamo-electric machines are constructed so that strong magnets are brought into suitable relation with coils of wire, and arrangements are provided in generators for collecting the electricity appropriately, or in motors for leading the current into the coils properly. The two classes of machines are almost identical, and many may be used either as generators or as motors.

18. *Extension Bell.* A secondary electric bell arranged to repeat at a distance a signal that is also sounded at the principal bell. Extension bells are often attached to telephones so that a call will be sounded, not only at the telephone, but also in some other room in the building.

19. *Fixture, Combination.* A gas fixture so made that either gaslight or electric light or both may be used. The gas pipe is surrounded by a casing, and the space between the two is sufficient to admit the electric wires.

20. *Flexible Cord.* An insulated electric conductor made of a number of very small copper wires wound loosely together. Usually two of these insulated conductors are twisted together, forming a pair of conductors that can be treated like a cord and used conveniently for pendant lamps and for lamps or other electric appliances that are to be moved about.

21. *Gas Lighting.* The ignition of gas jets by means of electricity. This is accomplished by making small electric sparks occur in the escaping gas. In theatres or other buildings where a large number of jets are to be lighted simultaneously, a fine wire runs from a frictional electric machine or induction coil through each of a group of jets and back again to the machine or coil. The wire is not continuous, but is broken at each jet, and the electricity in order to pass must spark through a small air space. The gas is turned on before the electricity and is consequently ignited when the spark occurs. Except where a number of jets are lighted simultaneously, the sparks are usually caused by breaking an electric current that passes through a coil of wire wound many times about a bundle of iron wires. Such a coil causes a sudden impulse of electric pressure at the moment the circuit is broken, and the spark thus formed is much more intense than that formed upon the breaking of an ordinary circuit. When gas is to be thus lighted electrically, the gas fixtures are provided with special fittings at the jets for forming the sparks at the proper time and place. Sometimes the gas is turned

on independently, and a pendant is then pulled which causes a lever to rise and make and break an electric contact just above the aperture from which the gas issues. Usually the fittings are arranged so that a pull on a pendant turns on the gas and then causes the spark. The second pull turns off the gas. Gas may be turned on and lighted from a distance by the pressing of a button, but in this case the mechanism at the jet is more complicated. The electric current which flows when the button is pressed causes the armature of an electro-magnet to move a lever which in turn opens a gas cock or valve. At the same time a succession of sparks is formed. The circuit is so arranged that when a second button is pressed the armature of a magnet causes the gas to be shut off and the light extinguished. The two buttons are sometimes side by side, but may be widely separated; as, for instance, one at the top of a stairway and the other at the bottom. The lighting button is always white, and the extinguishing button black. Electric gas lighting arrangements are connected together into a general system, one battery and one spark coil being provided for the whole. Insulated wires are run to each gas jet, and if electric light wires are on the same fixture the gas lighting wires have the same quality of insulation as the electric light wires.

22. *Hanger Board.* The slab of insulating material from which an electric arc lamp is hung. The board is fastened to the ceiling, and usually has mounted on it connection blocks for the wires and a switch by means of which the current may be cut off from the lamp.

23. *Incandescent Lamp.* (See Lighting, Electric.)

24. *Insulating Joint.* A joint used in attaching a combination fixture to the gas piping system of the building. The insulating joint isolates a fixture electrically by preventing connection between fixtures through the metallic piping. When these joints are used, if an electric wire on one fixture comes in contact with the metallic part no trouble is caused unless the other wire of the circuit also comes in contact with the same fixture, while, without the insulating joint, if one contact were made there would be liability of trouble at any weak place in the insulation of the other wire, in any part of the wiring system.

25. *Insulating Tube.* A tube made of insulating material (usually porcelain, glass, or pottery) used to protect insulated wires from abrasion, and to provide effectual insulation where the wires pass through walls, floors, partitions, etc. The tubes have a flange on one end to prevent their slipping through holes.

26. *Insulator.* A non-conducting support for electric wires. Insulators are usually made in the form of blocks or knobs, and are now almost always made of glass or porcelain, for they must be substantial, should not absorb moisture, and should not be affected by heat.

27. *Junction Box.* A box, usually of iron, that is used with the conduit system of electric wiring where branches are taken from the main wiring. The conduit tubes end at these boxes, and it is here that wires are inserted and joined to the system of wiring.

28. *Magnet.* In practice, a piece of iron or steel that attracts other pieces of iron or steel, and that is itself attracted or repelled by another magnet or by a current of electricity passing in an appropriate direction. A piece of steel once made a magnet becomes a permanent magnet. A piece of iron or steel may be made magnetic by passing round it a current of electricity, and metal surrounded by a coil of wire through which a current of electricity may be passed is called an electro-magnet. If the core or surrounded substance is soft iron, which is only temporarily magnetized, the magnet may be made strong or weak according to the strength of the current sent through the coil. The armature of a magnet is a piece of iron placed near one or both ends of the core where it will be strongly influenced by the attractive force. The power of the magnet is made available by attaching the armature to the mechanism to be operated. Magnets are extensively employed in the various electrical appliances used in buildings.

29. *Meter, Electric.* An instrument for measuring an electrical quantity such as current, pressure, or energy. A recording watt meter or recording watt-hour meter is the instrument placed in buildings for measuring and recording the amount of electrical energy used. The energy is equal to the product of the current, the pressure causing this current, and the time during which the current flows. In one form of meter a predetermined proportion of the current is made to deposit metal from a chemical solution, and the energy is computed from the quantity of metal deposited. Other forms are similar in appearance to a gas meter. A drum is caused to revolve whenever current is used, and it revolves at a speed proportional to the product of the pressure and the current. The time it continues to revolve of course depends upon the time the current is being used. The drum moves a train of light gears, and indices show the energy consumption as a gas meter shows the consumption of gas.

30. *Moulding.* A strip of wood fixed to a ceiling or wall and arranged to conceal electric wires and enclose them so that the insulation will not be abraded. The moulding is composed of two parts, a backing which has grooves in which the wire is run, and a capping which is nailed on after the wires are placed.

31. *Netting for Arc Light Globes.* A coarsely woven wire netting that is placed

about an arc light globe to hold the pieces in place in case of breakage.

32. *Pump, Electric.* A pump operated by means of electrical energy. The pump proper is an ordinary power pump, and to this is attached, either by a belt or by direct coupling, an electric motor which furnishes the power. The facility with which electric motors are started and stopped, the small amount of attention they demand, and the possibility of drawing the energy from a central station make the electric pump very desirable in many places.

33. *Push Button.* A device for opening or closing an electric circuit, consisting of two contact-pieces of metal connected to the wires of the circuit, and a small button which is normally held outward by a spring. This button can be pushed inward by the finger to bring the contact-pieces together and thus close the circuit, or in special cases to separate the contact-pieces and open the circuit.

34. *Rosette, or Ceiling Block.* A small circular block, usually of porcelain, that is used where a pendant incandescent electric lamp is connected to the wiring. It contains brass contact-pieces for the convenient connection of the lighting wires and the conductors running to the lamp. When fuses are also provided it is usually called a ceiling cut-out or fusible rosette.

35. *Shell, Electric Light Fixture.* A cup-shaped piece of thin metal that is placed about the fixture where it is attached to the ceiling or wall. This shell covers the joints, and the wires that are led to the fixture.

36. *Socket, Incandescent Lamp.* A brass receptacle into which the incandescent lamp is fastened. Electric wires are brought into the socket and attached to terminal pieces so arranged that when the lamp is fastened in the socket, each end of the lamp filament is in electrical connection with one of the two wires of the circuit. In a key socket a small switch makes or breaks the electric circuit and thus turns the lamp on or off.

37. *Spark Arrester.* A screen usually made of finely woven wire that is placed about an electric arc lamp so as entirely to enclose the arc and prevent the escape of the small sparks coming from the carbons.

38. *Storage Battery.* A battery composed of electro-chemical cells that are put in active condition when an electric current is passed through them. When the electric current is passed through the cells there is a chemical change, the electric energy being thus stored as chemical energy. Upon disconnecting the dynamo-electric machine or other source of electricity, the chemical condition of the cell tends to become as it was originally, and if the wires from the cell be attached to lamps or other receiving apparatus a current of electricity will flow, the stored chemical energy being transformed back to electrical energy. Storage batteries are used to a considerable extent in places where a generating plant would not be admissible, as in electric launches or electric carriages. They are largely used in connection with generating plants, for their use makes it possible to run the engines and generators at their maximum efficiency for a part of the day, the battery furnishing current while the generators are shut down.

39. *Switch.* A device for shifting an electric current from one circuit to another, or for making or breaking connection with a circuit. Switches are of various forms according to the service for which they are designed. A jack-knife switch has copper blades that are hinged so that they can be thrown into and held by spring clips when the circuit is to be made, or pulled out of the clips when the circuit is to be broken. A snap switch is a small switch ordinarily used to control a few lights. With the common form the handle turns round in one direction, a half turn making contact with the circuit and the next half turn breaking the circuit. A stiff spring snaps the contacts into place so that they cannot be left halfway. A flush switch is one made to set into the wall so that the face will be flush with the surface of the wall. A series arc light switch simply shifts the current from the lamp to a metallic connection taking the place of the lamp, for as series arc lamps are connected the circuit must not be broken. A service switch is a switch placed at the point where the wires enter the building, and by means of it all connection with the interior wiring may be cut off.

40. *Switch Board.* The board, slab, or frame on which are mounted the controlling and regulating appliances of an electric plant.

41. *Telephone.* An instrument for reproducing sound at a distance. In the electric telephone the sound moves a diaphragm in the sending instrument, which is so constructed that waves of electric current are produced corresponding to the pitch and intensity of the sound. At the receiving instrument, which is connected to the sending instrument, or transmitter, by wires, the waves of current pass round a small electro-magnet which attracts a soft iron diaphragm in accordance with the frequency and strength of the waves and consequently in accordance with the pitch and intensity of the sound acting at the sending instrument. The vibrating diaphragm sets up sound waves that produce the counterpart of the original sound. To facilitate intercourse by means of telephones the instruments in different buildings are connected by wires to a central office, where an operator can connect any two lines together. Signals to attract attention are produced ordinarily by a small dynamo-electric machine placed at each instrument and operated by hand. Where the

distances are very short the ordinary electric bell and push button are often used. Formerly it was the common practice to use the earth in place of a return wire — only one wire being run from the central office to each instrument. The telephone, however, is so susceptible to minute currents of electricity that as other applications of electricity became common it became necessary to employ with the telephone a complete metallic circuit thoroughly insulated so as to be free from stray foreign currents. An independent line instrument is one that has a complete line of its own running to the central office. An ordinary party line is common to several instruments, and all signals and communications can be heard at all instruments on the line. With the selective signal party line any instrument selects the signals intended for it but responds to no other. With these selective signals there is sometimes also used a lock-out device that cuts out of communication entirely all telephones on the party line except the one designated by the operator at the central office. The so-called speaking tube system for use in a single building or group of buildings is a small exchange system that requires no operator. From each telephone there is a line to every other telephone, and the proper connection is made at the sending instrument by the person speaking.

42. *Temperature Regulator.* Apparatus for automatically opening or closing dampers in furnaces, or otherwise regulating heat supply according to the temperature of the place supplied. A thermostat is set to make an electric contact when the temperature arises slightly above normal or falls a little below normal. The electric circuits are arranged so that when the temperature is above normal the contact will cause a current of electricity to operate a piece of mechanism that closes a damper or otherwise causes the heat supply to diminish. When the temperature falls below the normal the action is reversed.

43. *Thermostat.* A device actuated by changes in temperature and designed to perform some action such as opening a valve or closing an electric circuit when a certain temperature is reached. Thermostats are used in temperature regulation and in automatic fire-alarm systems. They are virtually the same in principle as thermometers, but they act instead of simply indicating. They sometimes consist of the ordinary column of mercury with an electric wire running into the bottom of the tube and touching the mercury, while at the top of the tube is the other wire of the electric circuit. When the mercury rises to a point corresponding to a certain temperature, contact is made with the upper wire and an electric current can flow and perform any action desired. Another form consists of two strips of substances that expand unequally when heated. The strips are placed side by side and joined together so that the bar thus formed curves one way or the other with changes in temperature. The movement of the bar can be made use of to make or break an electric circuit, or to move valves that allow compressed air to actuate mechanism.

44. *Transformer.* An electric appliance used in connection with what is called the alternating current system, for changing the pressure at which electrical energy is delivered. Electrical energy is the product of the current and the pressure that produces this current, so that the same amount of energy may be represented either by a high pressure and small current or by a low pressure and large current. It is more economical to transmit energy at a high pressure because the current is then small. Energy at low pressure is safer and more convenient to use. With the alternating current system energy is transmitted at a high pressure, and at the building where current is to be used a transformer is employed to transform the energy so that the pressure may be low and the current correspondingly greater.

45. *Vapor-tight Globe.* A glass globe that fits tightly over an incandescent lamp bulb and socket, and excludes moisture or corroding gases.

46. *Voltaic Cell.* An arrangement of suitable metals or other substances in an appropriate liquid or electrolyte, by means of which chemical energy is transformed into electrical energy. Voltaic cells are used in buildings to furnish the electricity for the operation of electric alarms, bells, etc. There is a great variety of cells, the difference being due to attempts to improve the effectiveness, the economy of operation, the constancy, or the convenience. The general principle is indicated by the simple combination of a vessel of dilute sulphuric acid containing a piece of zinc and a piece of copper separated by the liquid. If the two metals are joined outside the liquid by a wire, a current of electricity will flow. At the same time the zinc gradually goes into solution in the acid and the acid is decomposed, hydrogen being given off at the surface of the copper. This chemical action ceases when the wire is disconnected. (See Battery, Electrical Appliances, 5.)

47. *Watchman's Register.* A piece of apparatus for recording the hours at which a watchman visits different stations in his rounds. The system consists of a recording instrument or register, a battery for furnishing electric current, connecting wires, and devices at the different stations which enable the watchman to send signals to the register. The station devices consist sometimes of simple push buttons, but they often can be operated only by a key that the watchman carries. The register is moved by clockwork, a diagram usually revolving like the hands of a clock. When a

signal is sent from any station in a building a distinctive mark is made on the diagram so that the time the station is visited is recorded.

— Russell Robb.

ELEVATION. A drawing which represents a vertical right line projection of anything, especially the exterior of a building or part of a building, on one side, or any part thereof. Cf. Ground Plan, under Plan; Plan; Section.

ELEVATOR. *A*. A car or platform to convey persons or articles up or down to the various floors of a building. It may be raised and lowered by hand, steam, hydraulic, pneumatic, or electrical power, or by the force of gravity acting on weights. An elevator generally moves vertically, but may be arranged to run on an incline. Small elevators for conveying dishes and other small household articles are commonly known as dumb-waiters, and these are usually operated by hand. Large hand elevators are commonly known as hoists or hand hoists. (See the term under Office Building.)

B. An apparatus for raising merchandise of any kind, such as grain in bulk; and, by extension and more commonly, a building containing many grain lifters and large bins for the storage of the grain. (See Grain Elevator.)

— D. N. B. S.

Screw Elevator. One of the earliest forms of elevator, in which the cage is raised or depressed by the direct action of a screw. In later elevators the principle of the screw is more scientifically applied in the form of a worm gearing, acting on the drum of the elevator machine.

ELEVATOR, ELECTRIC. An elevator that is operated by means of an electric motor. With electric elevators the car, and to a certain extent the hoisting gear, are the same as with hydraulic or steam elevators. The electric motor simply furnishes the power, but the exigencies of operation usually require a specially constructed motor and special appliances for starting and stopping the elevator. With the elementary forms of electric elevators an ordinary motor runs constantly and is belted to a shaft which in turn is belted to the elevator hoisting drum mechanism. By means of tight and loose pulleys and open and crossed belts, which can be shifted from the elevator platform, the elevator can be stopped or moved either up or down while the motor runs continuously in one direction. This form is simple to install, but there is waste of energy if the motor runs constantly, even if it is not moving the elevator, and it is troublesome to start the motor each time the elevator is to be used. Various automatic starting appliances have been devised for use with these belted elevators, but they are rapidly being superseded by the direct coupled electric elevator. With this, the motor is connected directly with the hoisting drum by means of rigid gearing, and the motor is stopped or started in either direction according to the desired movement of the car. The usual safety devices are provided for the car, and brakes at the motor act if the electric current is cut off or if other trouble occurs. The electric elevator is self-contained, and on account of its compactness may sometimes be installed where other forms would be out of the question. It can be operated from a central electric station, and in this way often saves the considerable expense of operating a power generating plant in the building, and allows the use of an elevator in places where a generating plant would be prohibitive. The energy consumed by the electric motor operating an electric elevator is proportional to the load carried, and this fact forms the basis for a claim of considerable saving over the hydraulic and steam elevators.

Electric elevators are now constructed of all grades, from the dumb-waiter to the passenger elevator running over 500 feet per minute. The facility with which electric energy can be controlled makes the electric elevator peculiarly adapted for domestic use. One form of passenger elevator designed for use in private houses requires no attendant, but is started up or down, or stopped, simply by pushing the proper button. The doors to the elevator will open and close automatically. — Russell Robb.

ELGIN MARBLES. The sculptured marbles brought from Attica, by the Earl of Elgin, at the time that he gave up the British Embassy at Constantinople, about 1803. They were purchased by the nation in 1816 at a very low price compared with the expense incurred by Lord Elgin. The greater part of the collection is composed of sculptured slabs from the cella walls of the Parthenon, fragments of the statues from the pediments, and more or less broken metopes; but a few pieces come from the Erechtheion and other buildings. The injury done the Parthenon by wrenching the slabs of the friezes from the walls, in which they had remained intact until that time, was so very great that the two ends of the building could hardly have been thought ruined before that time, although the centre had been blown out by an explosion in the seventeenth century. It is to be said in defence of the persons responsible for this ruin that, at the time in which the enterprise began, it might well have been thought that the sculptures remaining in Athens were sure to be destroyed in a few years by the Turkish soldiery. The establishment of a peaceful government in Greece could not at that time have been anticipated. — R. S.

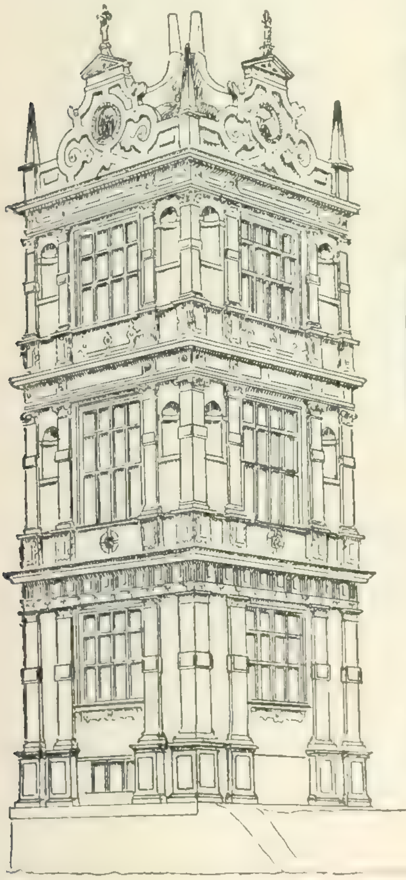
ELIAS (HELIAS) DE DERHAM (DERAM or BERHAM); canon of Salisbury.

According to a manuscript quoted by Leland (op. cit.), Elias de Derham, a canon, was the first architect of the cathedral of Salisbury. By bull of Honorius III. (Pope 1216–1227) the seat of the cathedral was removed from the fortress of Sarum (Salisbury) to a plot of ground called the Merrifield, where, April 28, 1220, the foundations of the present building were laid with imposing ceremonies.

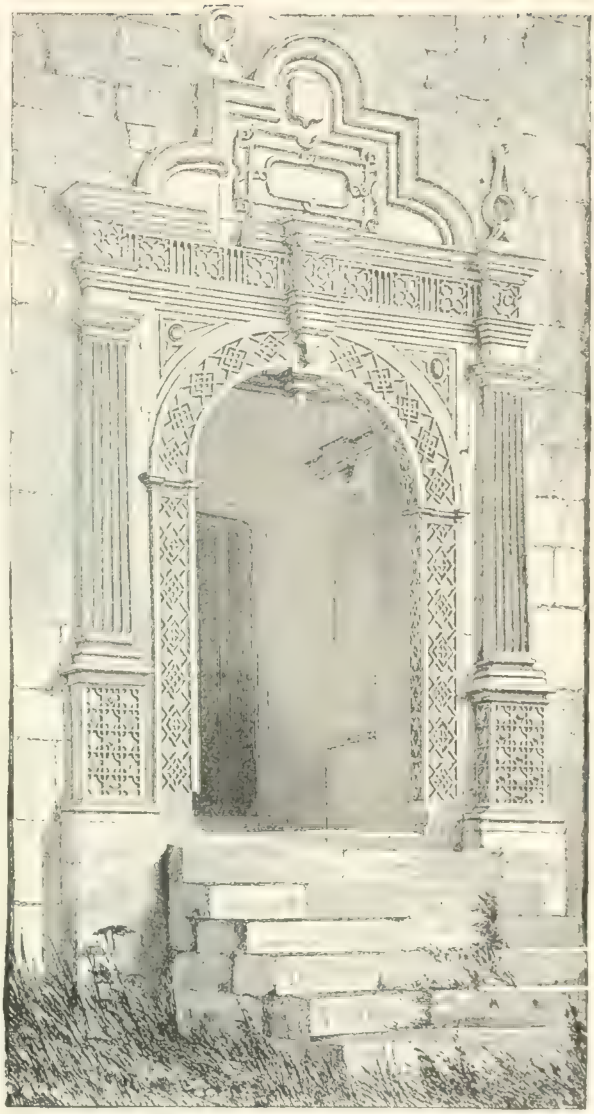
Leland, *Itinerary*; Britton, *Cathedral Antiquities.*

ELIZABETHAN ARCHITECTURE. That of the reign and times of Queen Elizabeth in England. It is that which grew out of the Tudor style mainly by means of the great country houses built by noblemen and landholders in England, who, finding the country at peace, and violence from civil or foreign war hardly to be feared, began to build great mansions in different parts of the country, with gardens and parks attached. This style may be considered as prevailing from about 1565 to Elizabeth's death, in 1603; the houses of Bramshill in Surrey, Longleat in Wiltshire, and Wollaton, Notts, may be mentioned as excellent specimens. (See England, Architecture of, and the bibliography appended to that article; also, Tudor.) There is no special treatise on the Elizabethan style.

— R. S.



ELIZABETHAN ANGLE TOWER, WOLLATON HALL (NOTTS).



ELIZABETHAN DOORWAY, GAINFORD HALL (DURHAM), c. 1600 A.D.

ELL. Same as L.

ELLIPSOGRAPH; ELLIPTOGRAPH. An instrument by which an ellipse of any given size may be drawn by continuous motion of a point, as of a lead pencil. One form consists of two grooves at right angles to one another, a separate rod having two pins, which slide in the grooves, and a point for drawing the curve. The pins and the sliding point are adjustable, and can be moved along the bar. As the pins are brought nearer together, the ellipse drawn becomes more nearly a circle.

A piece of string tied by its ends to two ordinary pins, which are fixed at the foci of the proposed ellipse, and a pencil which is retained by the bight of the string, may also be used.

— R. S.

ELMES, HARVEY LONSDALE; architect; b. Feb. 10, 1814; d. Nov. 26, 1847.

A son of James Elmes (see Elmes, James). He studied architecture with his father. In 1836, acting on the advice of B. R. Haydon, the painter, Elmes made designs for S. George's Hall, Liverpool (England), and was successful among eighty-five competitors. S. George's Hall was begun in 1838, and completed after Elmes's death by C. R. Cockerell (see Cockerell, C. R.). Elmes designed, also, the Assize Courts and Collegiate Institution at Liverpool, and the county lunatic asylum at West Derby.

Obituaries in *Builder*, Jan. 8 and Feb. 5, 1848; Stephen, *Dictionary of National Biography*.

ELMES, JAMES; architect; b. Oct. 15, 1782; d. April 2, 1862.

Elmes was a pupil of George Gibson, architect, and at the Royal Academy, where he won a silver medal in 1804. He was made vice president of the Royal Architectural Society in 1809, and surveyor of the port of London at about the same time. He is best known by his writings, his chief work being *A Practical Treatise on Ecclesiastical and Civil Dilapidations* (3d ed., 4to, 1829). He published, also, *Memoirs of the Life and Works of Sir Christopher Wren* (4to, 1823, and 8vo, 1852); *A Practical Treatise on Architectural Jurisprudence* (1 vol. 8vo, 1827); etc.

Stephen, *Dictionary of National Biography*; Obituary notice in *Builder*, April 19, 1862.

ELYAS DE DERHAM. (See Elias de Derham.)

ÉLYSÉE. In Paris; properly *Le Palais de l'Élysée;* built in 1718 by the architect Armand Claude Mollet or Molet. The building was originally the residence of the Comte d'Evreux, but was enlarged and much enriched in 1773, and then passed into the possession of the crown. In 1855 it was again much altered under the name of restoration; and the cutting of the street through from the Faubourg S. Honoré to the Avenue des Champs Élysées left it with its garden isolated on every side. Since that time it has been more completely a palace than before, and, although it had been previously the residence of the first Napoleon at different times, and of other sovereigns and princes, it was established as the residence of the chief of the state at the time of the Republic of 1848. Under the present Republic it is used for the same purpose, and, therefore, is not much visited as a national monument. — R. S.

EMBANKMENT. A banking or building of a dyke, pier, causeway, or similar solid mass; hence, by extension, the result of such work, especially in the form of a waterside street. The term is used to translate foreign words, such as the Italian and Venetian *riva*, *fondamenta*, and *molo;* also, for the French *quai*, for which the English quay is not always an adequate translation. (For the London embankments along the sides of the Thames, see subtitles.)

Albert Embankment. In London; on the right or south bank of the Thames, between Westminster Bridge and Vauxhall Bridge; completed in 1870.

Chelsea Embankment. In London; on the left or north bank of the Thames, above Westminster and near Chelsea Hospital; finished in 1873.

Victoria Embankment. In London; a broad quay with carriage road and footway on each side, built along the left bank of the Thames from Blackfriars' Bridge to Westminster Bridge, between 1865 and 1870. The granite obelisk, called sometimes Cleopatra's Needle, brought from Alexandria in 1878, stands on this part of the water front.

EMBATTLE (v.). To form or construct with or like battlements, *i.e.* with merlons and embrasures. The term is applicable alike to structures and to mere ornament resembling battlements in outline, as an embattled fret.

EMBATTLEMENT. The same as Battlement. (Written also formerly embattailment.)

EMBLEM. A picture, sign, or device employed to mark a rank, to distinguish a person, to typify some particular political or religious body, or the like; thus, a mitre marks the episcopal rank. (See Symbology.) — C. C.

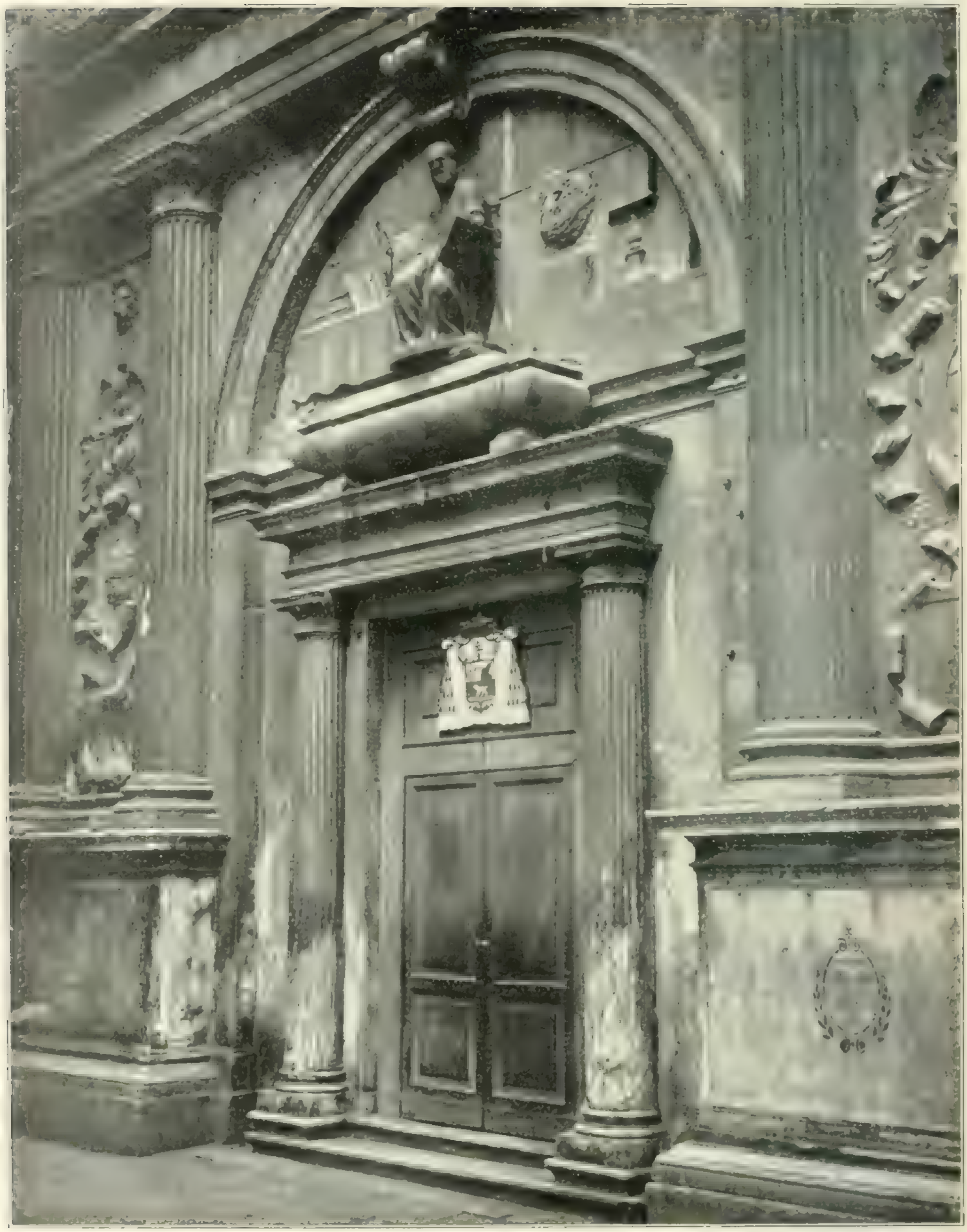
EMBOSSED WORK. In general, decorative work in relief, produced, not by carving or casting, but by stamping, hammering, pressing with a die, or like use of mechanical force; such as that done in sheet metal by "striking up" from behind. (See Metalwork; Repoussé)

EMBRASURE. *A*. An enlargement of a door or window opening, at the inside face of the wall, by means of splayed sides. Especially, in military construction, such an enlargement designed to afford a more extended range of vision from the inside by means of the sloping sides, while not increasing the outside opening. Hence, —

B. In military architecture, any opening through, or depression at the top of, a wall or parapet for discharging missiles; as a loophole, crenelle, or the like, because usually so splayed.

EMPLECTON; -UM. A kind of masonry used by the Romans and described by Pliny and Vitruvius as having the faces worked and the core or filling of rubble, bonded more or less thoroughly with the face stones. Vitruvius (II., 8) speaks of this work as very often done carelessly and slightly by the Roman workmen of his time.

PLATE XXXII



ENGAGED COLUMN

Church of S. Geminiano, at Venice; a smaller order decorating the doorway and a larger one raised on a high continuous podium. The statue is the work of Jacopo Sansovino.

ENAMEL. A variety of glass which is used especially for decorative work: either inlaid in another surface, as of metal, or forming a mosaic with a metal ground or frame to hold it in place, or covering the whole surface. By means of enamel, decoration of church vessels and pieces of domestic use and adornment is made easy and effective. The term enamelling, applied to the process of laying enamel upon a surface or of adorning an object with enamel, is extended to mean, in the popular sense, a certain kind of finish by means of paint and varnish. (See Paint.)

EN AXE. (See under Axe, I.)

ENCARPUS. A sculptured festoon of fruit and flowers, or, more rarely, of drapery, or composed of a trophy of arms, or the like. (See Festoon; Swag.)

ENCAUSTIC. Fixed by heat; applied by any process to which heat is essential.

ENCAUSTIC PAINTING. Literally, a painting which implies the application of heat either during or subsequent to its execution. This process is said to have been much employed by the Greeks both for mural and easel pictures, as well as for ships; nor was its use confined to the Greeks. As a mural process it was ultimately replaced by fresco. Encaustic, or καῦσις, implies a "burning," the colours being mixed with wax. Unfortunately the words "encaustic" and "wax" were often used by ancient authors synonymously for "painting" and "colour," hence great confusion and uncertainty. No specimen of an important encaustic mural painting by Greek artists has been preserved. Greco-Egyptian mummy masks of a late period have been recently discovered, and it is asserted that some of these were painted by the encaustic process; others in tempera; others, again, in both tempera and encaustic. The celebrated head called "The Muse of Cortona," preserved in the museum of that town, is said to have been painted in wax. Vitruvius gives as a receipt for the preservation of vermilion-coloured walls exposed to the sun, a final coat of punic wax and oil *cauterized*, and subsequently rubbed with a candle and fine linen. The mural paintings of Pompeii, Rome, and its environs were probably painted in fresco, sometimes in tempera, or in a combination of the two methods. For a complete restoration of the encaustic process, the reader is referred to the work by Cros and Henry (Paris, 1884), which, if not exact, certainly is ingenious. According to these authors the colours are melted with wax and resin, then applied with a brush, and afterward modelled with heated instruments called *cauteria*. Any wax painting when completed may, or may not, be "burnt in" by the application of heat. The effect of the burning is to give a slight gloss to the surface, increase the depth of the tone, blend the modelling, and cause the colours to penetrate more deeply the wall surface, if the latter be absorbent. Some authors hold that the Greeks knew of the dissolution of wax by a volatile or essential oil, such as turpentine; others deny the fact. If they did have such knowledge, they also must have painted as the men paint to-day who use a wax medium, and the reader is referred to the article on Wax Painting. In this case, moreover, if heat were applied, it would have been *after* the picture was completed.

FREDERIC CROWNINSHIELD.

ENCAUSTIC TILE. (See Tile.)

ENCHASED. A variety of hammered metal work in which a pattern in relief is produced by punching or hammering down the background or depressed portions of the design. (See Chase.)

ENDIAPER. To decorate with a diaper pattern.

ENFILADE. The alignment of all the doors between the rooms in a series or suite so as to produce a vista. Usually such a series of doors were placed near the window walls, though this is not now deemed essential. A very remarkable example is that of the Palazzo Borghese at Rome (1590, by M. Lunghi, the elder), in which dignity and scale are given to a long series of rooms, much cramped by the irregular site, by a vista through eleven successive doors connecting them.

En Enfilade. In French, arranged in series or a suite; often used in English with reference to the above definition. (See En Suite, under Suite.)

ENGAGED. *A.* Attached, or apparently attached, to a wall by being partly embedded or bonded into it, as a column, pier, or pilaster.

B. Framed into or fitting upon or within, as the end of a beam or girder into the cap of an iron or steel column.

ENGAGED COLUMN. A round pilaster-like member, generally ornamental in character, without utility and most commonly built with the wall, or as part of the wall whose courses of stone are continued through the shaft. Even where the engaged column is a piece of costly and beautiful material, and is therefore not continuous with the structure of the wall, it is to be considered as a pilaster with a rounded horizontal section, rather than as a column. (Cut, cols. 883, 884.)

ENGELBERGER, BURKHARD; architect; d. 1512 at Augsburg.

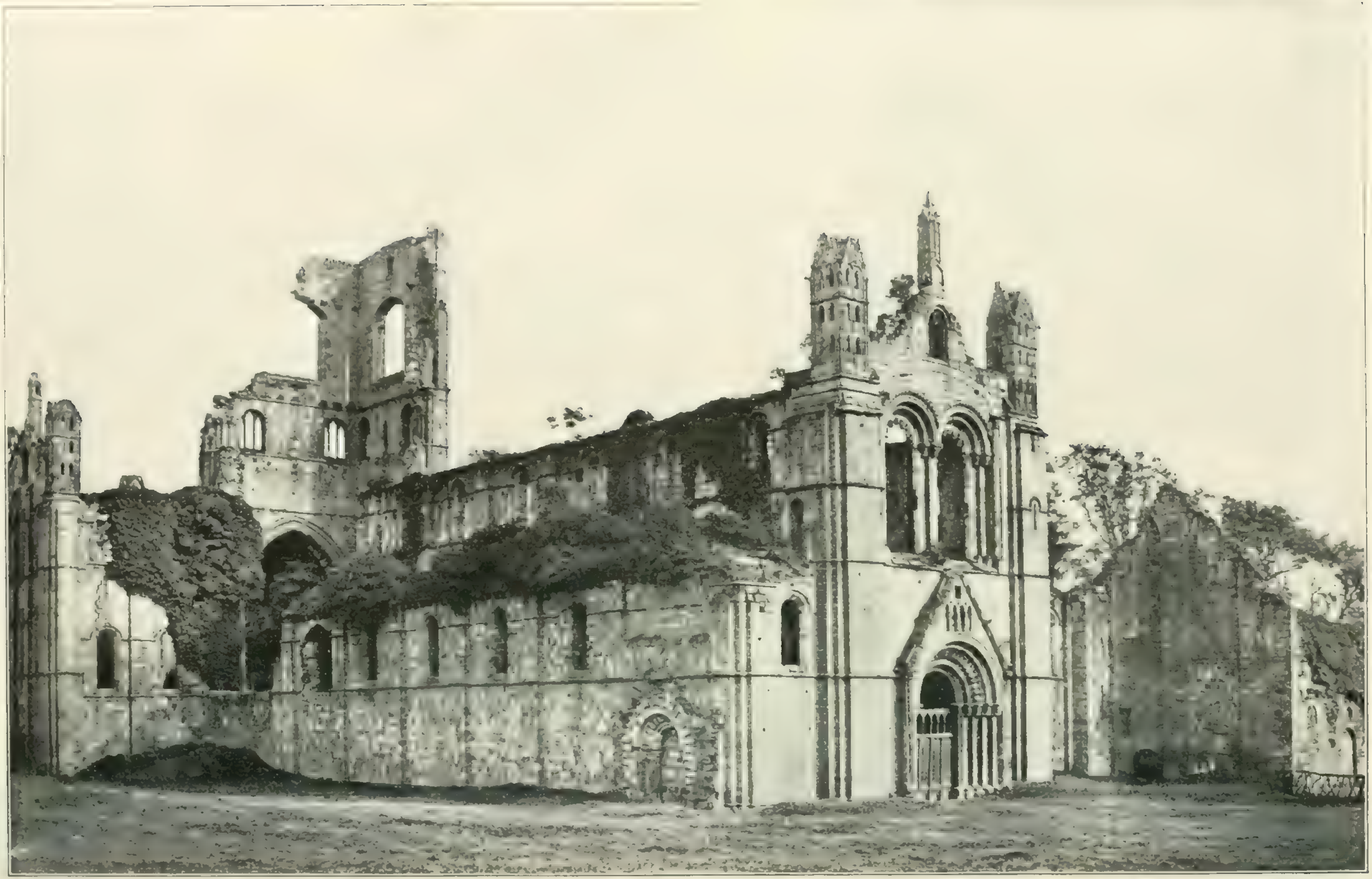
Burkhard Engelberger of Hornberg (Würtemberg, Germany) built, between 1467 and 1499, the churches of S. Ulrich and S. Afra in Augsburg (Germany). In 1494 he was called to Ulm (Würtemberg, Germany), to strengthen the supports of the spire of the cathedral, which had begun to sink.

Seubert, *Allgemeines Künstler-Lexicon.*

ENGINEERING. The study and pursuit of mechanical or constructional operations according to theoretical and strictly scientific principles, as distinguished from similar work done by traditional or empirical methods. The different branches of engineering differ so widely among themselves that the term is hardly ever used alone except as expressing, in a general way, the occupations followed by a number of highly trained men; much as "war" or "agriculture" are used to classify, in a general way, other human pursuits. That department of engineering which is of interest to students of architecture is generally called civil engineering, though of this only one branch is architectural in the sense used throughout this Dictionary, namely, that which has to do with the building of immovable structures, and those, in the narrower sense, covered by the common term "built," to the exclusion of bridges, railroad embankments, and the like. The term "architectural engineering" is in common use; but it has been used to signify especially the pursuit of those who offer advice, and, as it is called, "consultation"; although the term is equally applicable to those who undertake the immediate design and execution of steel cage construction for modern building and any other structural parts which need scientific treatment. It is to be observed that in architecture generally those parts are few. Floors are always built much stronger than absolutely necessary, and this that they may be rigid and not disagreeably subject to vibration and gradual settlement. Brick walls are built thicker than absolutely necessary, partly because of the building laws of different cities requiring this on account of safety against fire, or the proper protection of flues carried up in those walls, and partly, in exterior work, for the sake of a massive effect. Roofs, spires, turrets, and the like are generally made secure against any wind pressure other than a tornado, because of traditional ways of building which are not often abandoned. An architect may be actively employed for a number of years without ever having had occasion to use engineering methods himself or to consult a professional engineer. On the other hand, modern iron construction, except in its simplest form, as in the laying of a floor of rolled beams and the hanging of fireproof flooring and filling to these, is commonly left for the plans or specifications, or both, of a professional engineer; and that because it is necessary to have a recognized factor of safety, and yet not to overpass it too much on account of the great cost of the material and workmanship.

Engaged Columns, Temple of Jupiter, Baalbek, Syria; Part of Interior Wall of Cella.

In a general way the division between the architect's and the engineer's work may be expressed in this way: — whatever is traditional in form and in structure, whatever is admittedly safe, whatever is known to all practical builders as well within the limits of danger, comes within the architect's province; and nearly all his most important artistical results are procured from the treatment of such building as this. All that is so new or so complex as to require careful scientific examination based upon mathematics is the province of the engineer. Some, but not many, modern architects are themselves competent, and, up to a certain point, may trust their own computations. Some, but not many, engineers have something of that traditional respect for beauty and significance of form that they may make their own designs for the decorative effect of structures which they have to carry out. The great majority of either profession are men who are greatly in need of the aid of those of the other profession, and what the outcome will be is at present entirely uncertain.



ENGLAND, ARCHITECTURE OF. PLATE I

Kirkstall Abbey, in Yorkshire; one of the traditional buildings which, since the dissolution of the monasteries by Henry VIII, have been left to go to ruin. The Abbey church is as perfect as any of the ruined buildings of its class in England, and having never suffered restoration, and having been built of a singularly durable stone, has kept its simple decorations almost uninjured. The building at the right conceals the cloister; it is probably the Frater or refectory and parlour of the monks.

It is worthy of note that in this combination of engineer and architect the world is returning to the methods still recognized as common to the Romans of the great Empire. As in a large public structure of the second century, a vaulted basilica, thermæ, or the like, the builder finished his work with but little more of design connected with it than would give a general comely shape and proportion to the different great rooms and halls, the decorators following him and completing the work with their marble linings, their tiling with glass, their mosaics, their stucco ornaments, and painting; so the modern structure, business building, apartment house, or private dwelling is already, and seems likely to remain, equally unconstructional in its architectural treatment. The steel cage structure, once built, must be entirely concealed and covered by fire-resisting and heat-resisting material; the brick walls are, almost without exception, run up plain, and support a plain floor of timber or of iron, vertical and horizontal surfaces alike prepared for complete concealment by the wainscoting, marble sheathing and tiling, plastering, and other superficial adornment upon which the original design of the architect mainly depends. This is as little to be resisted as the modern disposition to use long range rifles instead of the rapier and the broadsword. It is to be regretted only as we regret the disappearance of the sailing ship and of the fascinating traditions of old-time sailor life. A new school of decorative construction may, indeed, arise; but it is hardly conceivable that this will come out of engineering methods, nor of the multiplication of buildings requiring engineering methods. These can lead only to a perfected quasi-Roman system of building first, and decorating afterward. Decorative construction is probably to be had only in cases where engineering methods are deliberately rejected and traditional ways of building are followed exclusively. — R. S.

ENGINE HOUSE. *A.* In the United States, a building primarily for housing a fire engine and, in the larger cities, its hose wagon, together with the horses and men for its operation.

The inflammable construction prevalent throughout the United States has made necessary very large and efficient municipal fire departments, with a number of steam fire engines, which require very elaborately equipped buildings for their service, with various devices to increase the celerity in answering calls. Such an engine house has, usually, automatic contrivances which, at the sounding of an alarm, release the horses from their stalls, cause a clock to stop, and sometimes turn on the electric lights in the firemen's dormitories on the upper floors. The building is also usually provided with one or more sliding poles passing through wellholes in the floors, by which the men are enabled to descend to the ground floor much quicker than would be possible by stairs. The wellholes are frequently provided with trap doors which also are sometimes controlled automatically by the signal mechanism. The engine is stationed immediately in front of the door with the harness attached and suspended above the horses' positions, so that it may be dropped and secured in place almost instantaneously. The water in the engine's boiler is maintained at a high temperature by connection with a heater in the building arranged for immediate disconnection when an alarm is to be answered. Celerity in getting up steam is further assisted by oil-soaked cotton or other kindling under the fuel which is laid in readiness beneath the boiler. An engine house may sometimes contain also other apparatus, such as a water-tower and a search-light machine, and may also include the functions of a truck-house. (See Patrol-house; Truck-house.)

B. A building connected with a railway for housing locomotive engines. (See Roundhouse.) — D. N. B. S.

ENGINE ROOM. (Sometimes called machinery space.) That portion of the building devoted to the generation by machinery of heat, light, or power, or any of them, and sometimes including the space devoted to the storage of coal. The size of the space requisite depends on the size and character of the building and the character of the machinery installed. Under minimum conditions there should be devoted 3000 cubic feet of space for the purpose, which affords room for the heater and the storage of 25 tons of coal; for large buildings 5000 cubic feet of space should be a minimum for coal storing. Space should be allowed for boilers, if located in the same room, on the basis of one horsepower for each 7500 cubic feet of building with a clear space in front of the boilers at least 12 feet long and as wide as the boiler; additional space should be allowed for the other machinery in accordance with its character. A rough approximation would be to allow as much space for such machinery as is occupied by the boilers and fire room, when provision is to be made for electric elevators and lighting engines, and three times as much when provision is to be made for hydraulic elevator and electric lighting engines. The height of these rooms should be 10 feet as a minimum, requiring the use of specially designed boilers; 14 feet is good practice for the boiler room, and 12 feet for the engine room, with the usual type of boiler. — G. H.

ENGLAND, ARCHITECTURE OF. The history of architecture in England begins with the history of the English people. The English, as we know them to-day, with the various traits which go to make up their distinctive character, did not become a definite people, homogeneous and distinct, until the eleventh century.

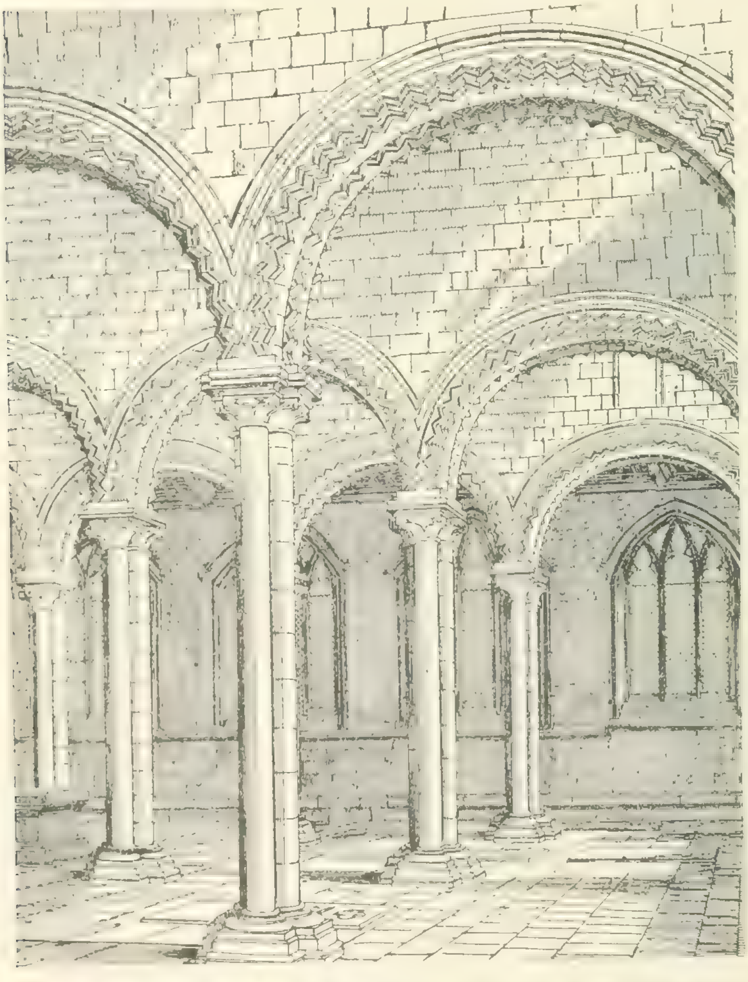
Before that time Britain had been the stage on which a constantly changing drama had been played, no part of which had permanently stamped the whole island, or firmly united its people.

We see first the Britons, a rude, ignorant people, but with many hardy virtues, trampled down under Rome until they are hardly more than serfs. After four hundred years of Roman rule, when the native population, tempered by Roman civilization, was beginning to blend with the Romans, and when the Romans in turn felt the influence of the Western life, and there was some promise of a new nationality, the Romans withdrew, and with them disappeared Roman civilization, its arts and its sciences.

The scene changes again. The Briton, used through long years to the protecting arm of Rome, fell an easy prey to the wilder tribes of north and west, and called on the Saxons. These followed the Romans and became at length masters of the islands. But among these German tribes there were many divisions. Angles, Jutes, East and West Saxons, strove with each other for the final supremacy, but no unity was achieved. Once more the scene changes. The Dane came to England to take his share in the government and to do his part toward moulding the Englishman. Finally, into the midst of this strange medley, came the Norman. This people, already modified by long residence on a foreign soil, seemed to take naturally to the ways and manners of their new domain, and intermarriage and the quietness of complete conquest and unity soon made England their home and themselves Englishmen.

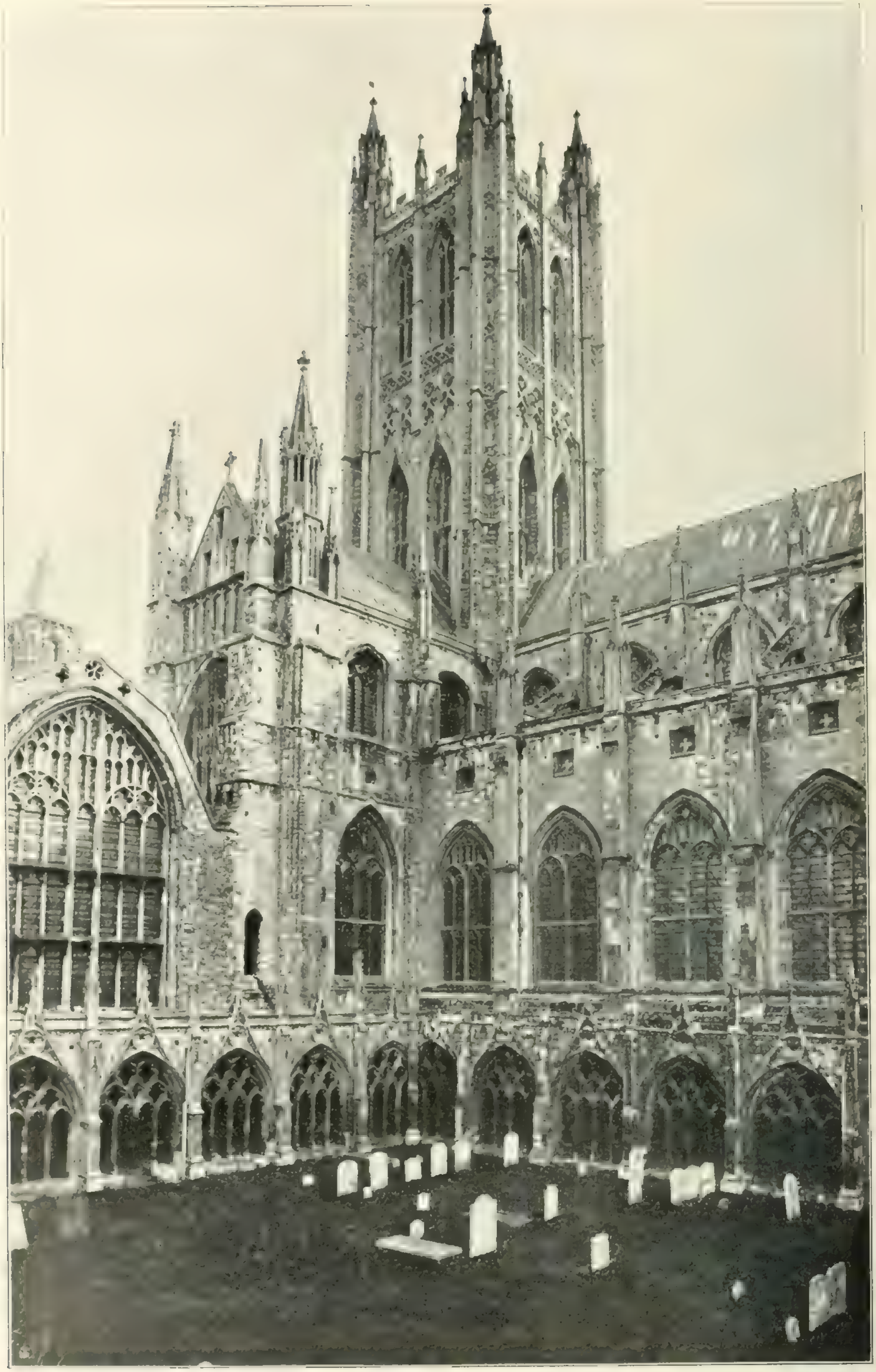
After Henry I., the Norman, as a Norman and a foreigner, began to disappear, and in his place came that type which we recognize as substantially the Englishman of to-day.

The Normans, entering England as conquerors in 1066, brought with them the first real architecture that England had known since Roman days, a style which in domestic work was the natural evolution of the struggle to maintain a hard-won footing in France, and which in ecclesiastical work was a rude development of the Southern Romanesque.



England: Galilee of Durham Cathedral; Close of 12th Century.

That no traces should remain of the architecture of the Romans after four hundred years of occupation seems almost incredible; but it must be remembered that the Romans lived in camps and in cities. The former naturally disappeared, and the latter seem to have been completely deserted by the native tribes, who had no civic aspirations or ambitions. In the troublous times which followed the Roman evacuation, the cities became deserted; places of refuge, and sources of pillage; there were



ENGLAND, ARCHITECTURE OF. PLATE II

Cathedral church, Canterbury, Kent. The plate shows the central tower and northwest transept from the northwest; the low arches in the foreground are those of the cloister, and the curious building with double-pitched roof and enormous perpendicular window is the chapter house. The central tower was built in the latter part of the fifteenth century and is called the Angel Tower, from a figure which has been removed, and the Bell Harry Tower, from a three-ton bell in the belfry.

none to protect and none to care for them, and so utterly were they ruined that hardly a trace of them remained.

Thus only can we explain the almost entire absence of Roman remains, and the absolute lack of any sign of the influence of Roman architecture, except, possibly, along constructional lines.

The centuries between the fifth and the eleventh had been of very little importance architecturally; dwellings were of the rudest description, and the churches as simple as possible, rude stone walls with roof of stone or timber. A few distinguishing features of the Saxon work are worthy of note, as indicating a knowledge of the arch and the vault, learned perhaps in Roman days and not quite forgotten, and indicating also the prevalence of wooden construction, which was evidently responsible for certain decorative features. The arch was used before Norman days, and there is reason to believe it to have advanced even beyond the purely constructional square reveal, to a reveal offset and ornamented; and the vault, although in the earlier examples formed only by converging walls, had certainly reached a true barrel vault coincidentally with the Norman occupation. The square towers, ornamented and reënforced with pilasters, and the basilican plan of many of the buildings, of which records remain, point to the influence of the Roman churches of S. Augustine's day, and the occasional use of diagonal pilasters recalls the early practice of spanning an opening with inclined stones.

Notwithstanding the prevalence of Roman influence in S. Augustine's day, it is curious to note that the apse, so invariably a feature of the basilican plan, never appeared in the ninth century work, — the east end was square. Another British or Saxon feature was the lofty crypt under the sanctuary. Both these were retained in later English work, and became marked English characteristics.

Before the Norman occupied England the influence of Romanesque work had crossed the channel, so that the last stage of Saxon work shows the introduction of the new manner, with its more generous use of the vault and its more profuse ornament.

Hardly anything remains of the Saxon work, certainly none of the important buildings now exist; but a few of the small buildings are in fairly perfect preservation, and one may trace Roman influence in the early British work, the influence of the Gregorian basilicas in the later Saxon, and the influence of the Norman in the last phase.

Throughout them all there was but little display of ambition or magnificence, and if the churches were simple the houses were still more so. But in these simple buildings there were expressed traits of character which were to influence the Norman and mould his architecture. The family life, rural life, the monastic establishments, all tended to modify the military and fortified character of the Norman buildings. For a while after the Norman occupation, Norman keep and castle rose throughout the land on continental models. A great square or round tower, enclosed by turreted walls, moats, drawbridges, and other barricades — everything for defence, nothing for comfort and convenience, such was the common character of the buildings. Side by side with these continental castles were the manor house and granges; the peaceful homes of those who tilled the soil, who owed allegiance to their lord, and were therefore closely allied to the castle and bound to it by common interests. Besides these two classes of domestic buildings, there were the establishments of the clergy, which increased very rapidly in number and importance.

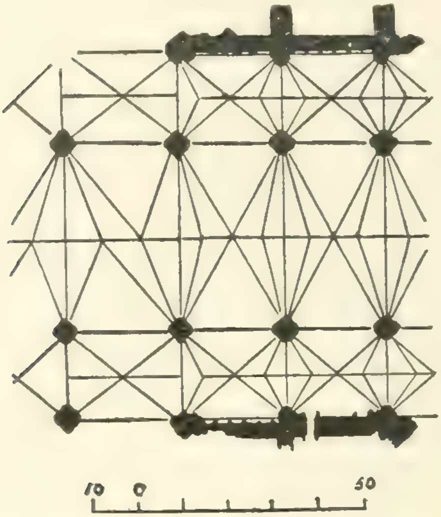
Peace brought wealth and leisure, and the nobles were not slow to see that the manor house afforded a pleasanter and more comfortable abode than their gloomy castles. Even abbot and prior were glad to enjoy the hospitality of their granges; and so presently one sees both overlord and prior spending much time in their manors, and turning their attention to the needs of advancing civilization and refinement. Ideas of comfort and convenience thus acquired soon modified the castle itself, and the growing power and wealth of the clergy found expression in monasteries and priories which were far removed from the simple primitive forms. It would be interesting in this connection to compare the ground plans of such a castle as Coucy — one must take a French example, as the English parallels nowhere exist intact — with the plan of Charney Bassett Grange. In one is displayed the epitome of the feudal system, in the other the first modest germ of home life.

The Church was then, and for many centuries after, a power of which we can to-day get but an inadequate idea. She ruled the king and his nobles as surely as she did the peasant and serf. The powers of heaven and hell were in her hand, and no prince was so mighty but that he trembled before her anger. It was but natural, therefore, that the chief expression of architectural vitality should be found in the ecclesiastical buildings of the Normans.

The architecture of the Normans was largely founded on the Southern Romanesque, but it was clearly a distinct phase of that style rather than an integral part of it. The structural problems which were wrestled with in southern France, especially the dome and its supports, played but a small part in Normandy, and the proportions of the Norman buildings were on lines different from those of the true Romanesque.

Nor is the skill of the carver, which is so important an element in the Southern type, much shown in the Northern type. The carving is simple and rude, but strong and effective, as is all the work of a primitive and virile people.

No great imagination as to structural problems, nor as to architectural aims, is displayed in the work of the eleventh and twelfth centuries, but it has all the charm of the simple, unpretending building, which serves its purposes and meets the aims of its builders.



England: Lincoln Cathedral: Plan of Choir Vaulting, 1225 A.D.

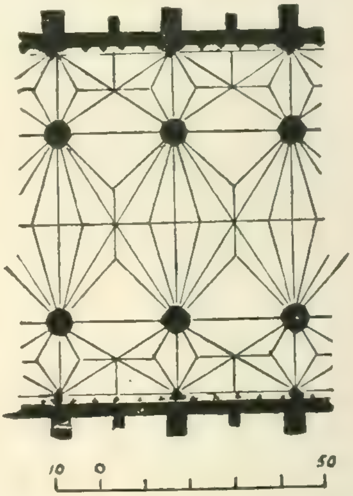
The most marked and important of the English Romanesque bore but little resemblance to that of southern France, but was very closely allied to that of Normandy. Southern France had received early in the eleventh century the idea of the dome. The constant intercourse between the Southern ports and Constantinople makes it both natural and likely that merchants should bring reports of the building of S. Sophia, and that masons even should travel from the East to the West. However this may have been, it is at all events clear that the dome, once introduced, opened possibilities so captivating that for two centuries nothing else could claim the attention of the builders of southern France.

At that time there was far less intercourse and less sympathy between southern France and northern France than between southern France and the East. France was still much divided both politically and socially, and it is but natural that the early and more native tendencies of the round arch architecture should have continued to develop independently of the dome. S. Front at Périgord, built in the early eleventh century, is a domed church on the plan of S. Mark's in Venice. It is pure Southern Romanesque, but it has no parallel whatever in England or in northern France. Now the dome, concerned primarily with covering square spaces, and needing for its full effect open areas, was little in touch with the Northern system, which was attempting to cover the basilican form of nave and aisles.

The dome, as one sees in the more perfect Eastern examples, found its full expression in a Greek cross plan, while the barrel vault sought length and was based naturally on the plan of the Latin cross. In southern France we see a tendency to combine the two, a doubtful experiment which hardly does justice either to the dome or the vault; but in northern France, the dome being unknown, everything tended to the development of the vault, and the impressive quality of length. One great difficulty with the dome was its exterior treatment, — as it is obvious that the same dome cannot look well within and yet be a pleasing external feature, — but the barrel vault and the crossing give excellent bearing for a central tower, which became a general feature of the Northern Romanesque.

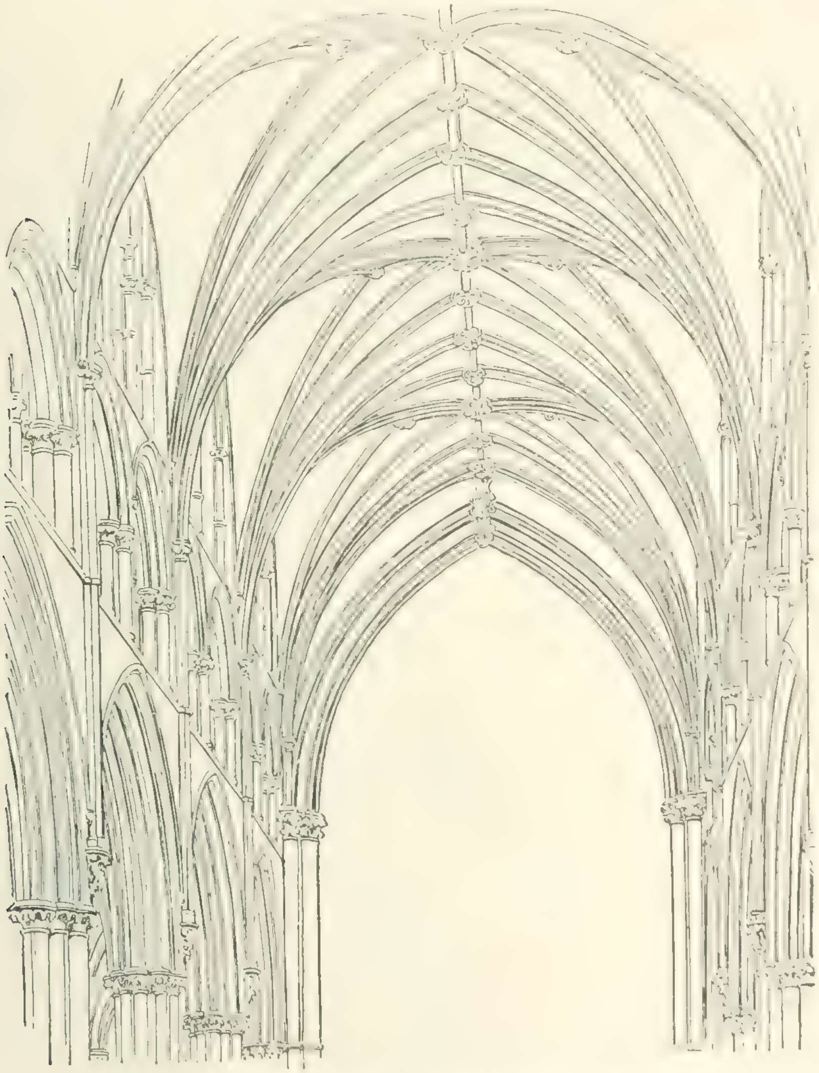
The long plan, the central tower, the ornamented arch, and the intersecting vault were the essential elements of the Northern Romanesque. This was the style which the Normans developed in England.

As has been seen, the architecture of the Norman, the new style, as it was called, had already, before the conquest, found its way to England, and Edward the Confessor had begun to rebuild his great abbey at Westminster in the new way. As compared with the existing Saxon work, it was so far advanced, and so much more logical and true, that it appealed very quickly to the English, and even the builders who were imbued with the Saxon methods adopted the ornamentation of the Norman work.



England: Lincoln Cathedral: Plan of Nave Vaulting, c. 1235 A.D.

Thus one finds, in the eleventh century, work clearly Saxon, yet with Romanesque features and ornament, especially in connection with the recessed arch jamb; and side by side with this we find Norman work which is closely paralleled by that across the channel. The striving for effect by making long vistas was even more marked in England than in France, and the central tower received more attention and became one of the typical features of English work, which marked all the later periods as well.



England. Lincoln Cathedral: Nave Vaulting. (See Plan.)

Thus we find the great abbey church at Saint Albans nearly 465 feet long, and with a central tower almost unrivalled in its perfect simplicity of mass and outline and the quiet reserve of its detail. It is worthy of note, too, that a trait which one recognizes as essentially English, not exactly parsimonious, yet thrifty and careful, led them to employ for this abbey — the most stupendous in England — the old Roman brick, and another English trait, a lack of very fine artistic perception, led them to cover this good red brick with mortar, that the whole might seem like stone, or one great block, rather than many pieces. Saint Albans typifies the simplest aims carried out in the simplest manner with very great success, and is a beautiful example of how much can be accomplished with sound materials, good proportions, and mass.

The end of the eleventh century was a very active period of building, and abbeys and cathedral churches were erected all over the land.

The inspiration came from the churches then built or building in Normandy, a country quite as much English as it was French. The growth in England was free and spontaneous, and very largely modified by earlier precedent. Sometimes the English churches were fairly plain copies, but in many instances they surpassed the originals in size and magnificence, still emphasizing the length of the nave and the importance of the central tower. The plan was invariably arranged for the vault, and the alternate arrangement of piers, indicating that the central vault was double the width of the aisles, gave great opportunities for effect, in the contrast between the clustered pier, which carried the transverse ribs of the nave and aisle and the diagonal ribs of the aisle, and the column which gathered on its cushion capital the aisle ribs only. The scheme was simple, perfect in its constructural expression, and very effective when carried out completely.

In many cases, however, the shafts of the great pier rose to receive nothing but a timber roof, lack of funds or of courage preventing the accomplishment of the vault.

As the arch opening was recessed and the orders carried down the jamb, so was the pier recessed to express the structure of the vault, the transverse and diagonal ribs, and all these recessed orders were made the object of special decoration.

The decoration was simple in form and rude in execution, but had the sterling qualities which mark the handiwork of an uncultivated but vigorous people. Similar ornament was later applied to surfaces, and where Saint Albans had rejoiced in its plain expanses, plastered and whitewashed, Norwich left hardly a stone uncarved in its great central tower. Colour was by no means despised, notwithstanding the whitewashing referred to, and there is evidence that the interiors, both those plastered and those finished in stone, were enriched with colour; but it was probably crude and raw, and only in the dim light of these vast buildings could it have been bearable. In the timber roof which so often replaced the vault, and the timber ceilings which concealed the roof, we have the precursors of the fine open timber roofs which in the following centuries were brought to such perfection.

The development of the house belongs essentially to this early period; privacy and comfort, the two first aims of a people reaching toward civilization, begin to make their claims. The great hall where the lord, his family, and retainers gathered together, and where all ate, and most of the men slept as well, still remained the centre of interest and of architectural importance. It was the most vital spot, around which everything congregated and which served to unite the motley crowd who gathered there as one family. But it was soon felt that the women and children required some more private rooms, and that much work which had been carried on in the hall might be better performed in special rooms; so the withdrawing room was set apart for the lady and her waiting women (it was at first a bedroom also), and the kitchen was supplemented by the various offices, in which baking, brewing, and all the occupations incident to caring for a large establishment were carried on.

With the further subdivisions of the needs of the household came separate dining rooms for the master and for the servants, separate withdrawing and sleeping rooms. This, however, belongs to a later period.

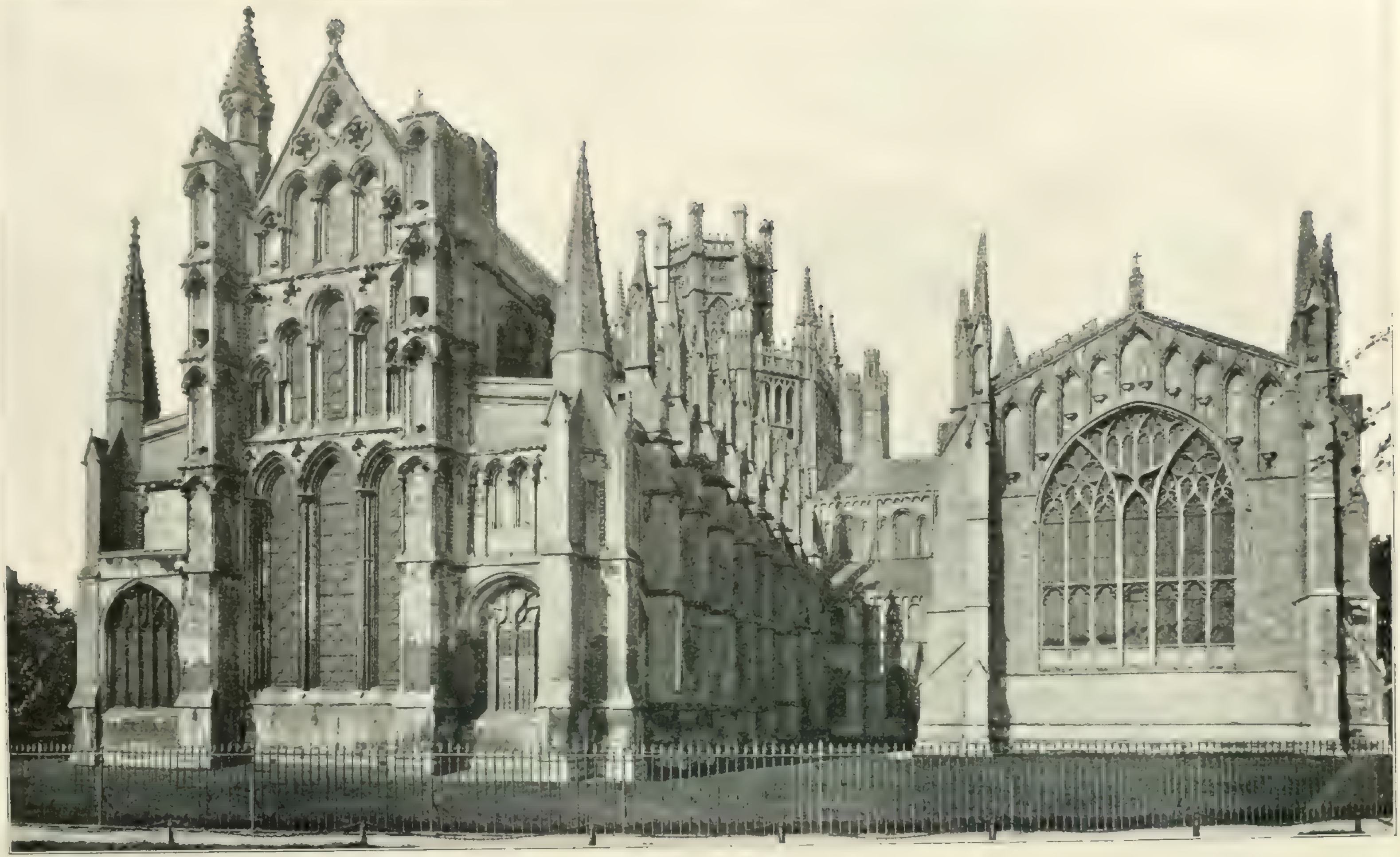
While the house was undergoing this development and expansion of plan, it was also modified and changed in its architecture by the gradual developing of Gothic work.

The first impetus of Gothic came, as did that of Romanesque, from across the channel, but, like its Norman predecessor, it took on a distinct impress and character at the hands of the English. They showed no more enthusiasm over problems of vaulting than they had over the dome, with the result that neither English churches nor cathedrals are lofty, nor rich in buttresses and pinnacles, the necessary accompaniments of great vaults; but they are simple, long, low, with towers and spires whose height is emphasized by the low roof line; and they are nearly all set amid beautiful surroundings of trees and greensward.

Indeed, this setting of the architecture in England is a thing that one cannot fail to notice in all classes of buildings, and it gives to one and all a charm which nothing else can give. The cathedrals are set on high as at Durham, with the town, studded with trees, leading the eye down to the sparkling river beneath, or on the level stretch of green as at Salisbury or Canterbury; the little churches have their peaceful cemeteries, old yews, and ivy; the great houses have their park and gardens and grand old trees; the small houses have their hedges and flowers. At every point English architecture has this immense advantage of setting.

During the most brilliant period of Gothic the Church was still all important, and in the ecclesiastical buildings is found nearly all that is of vital interest. The house was slowly developing into a more comfortable abode, but it was not developing with equal pace in architecture. All the wealth and magnificence of a prosperous country were lavished on the churches and monasteries.

From the thirteenth to the sixteenth centuries all the phases of Continental Gothic had their counterpart in England. There was the early style marked by the general adoption of the pointed arch, window openings still small and generally not subdivided, vaults quadripartite, ornament sparse and simple in character, partaking still of the Norman but without its robust and coarse qualities. Following on



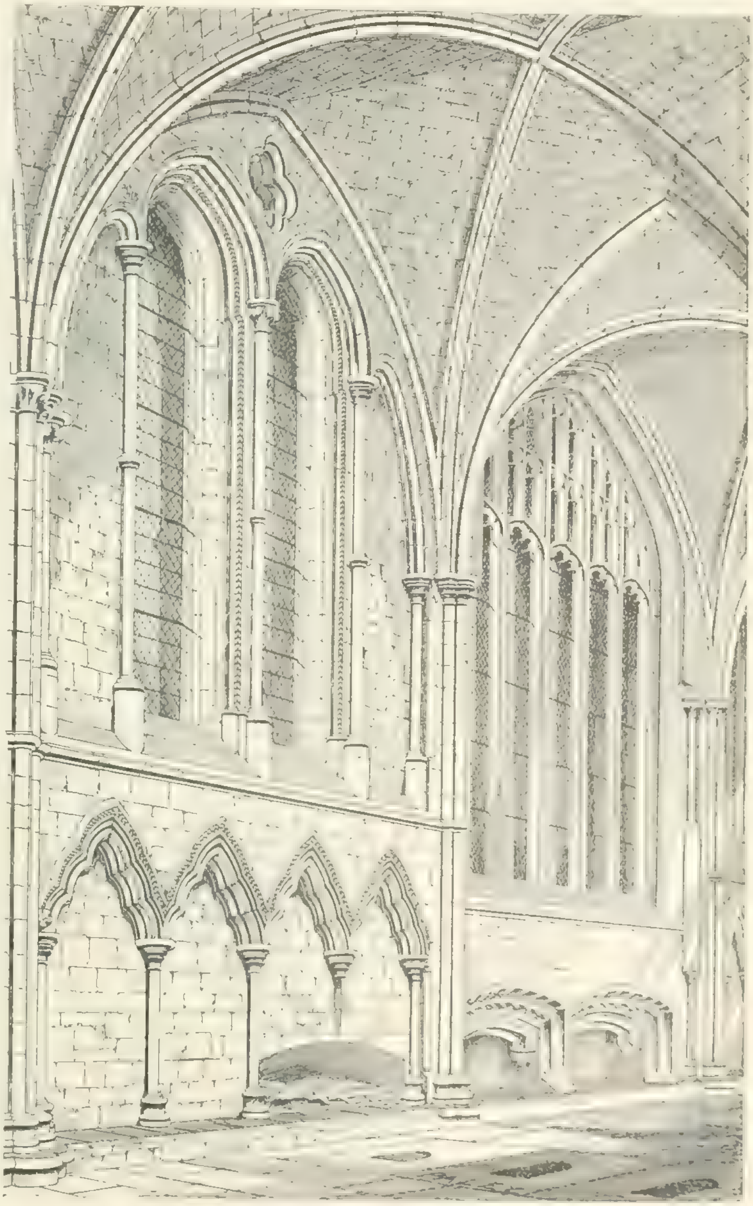
ENGLAND, ARCHITECTURE OF. PLATE III

Cathedral church of S. Etheldreda at Ely, Cambridgeshire. The plate shows the east end of the church, which is a remarkable piece of "Early English" design; beyond it, the central lantern which covers the famous octagon, a structure of wood imitating Gothic vaulting; the lantern itself, of wood covered with metal, and beyond it again the Romanesque western tower. On the right is the great Lady Chapel in a very unusual position; north of and with its axis parallel to that of the choir, and entered from the north transept by a low vestibule, this building, of the fourteenth century, and marking the transition from "Decorated" to "Perpendicular," is of singular interest, and has a most elaborate system of vaulting of a still later date.

this so-called early English work came the development of buttresses, the decrease of wall surfaces and increase of window openings, the subdivision of the window, and the development of tracery, and far more profuse use of ornament. This period has been generally referred to as that of the Decorated style. The final phase of Gothic saw still further development of window tracery, which, passing through flamboyant and flowing designs, settled into those composed largely of perpendicular lines, which were repeated again and again in the lines of buttress, parapet, turret, and tower. Both the decorated and this later phase, the perpendicular, had subdivided the vault until the simple quadripartite vault was almost forgotten, and good constructional precedent thrown to the winds, in the elaborate ribs which divided the surface and made it but an intricate network of panels.

When the Reformation came and so rudely stopped church building, it came to a people who were ripe to drop Church work. Some had felt the burden of the Church's yoke; they sought a personal God, and the glories of the Church were associated with hard memories; others, no longer in touch with mediæval faith and enthusiasm, found more interest in personal comfort and luxury than in the growth of an already too powerful ecclesiasticism.

Gothic work in England was not the same consistent constructional development as it was in France, and it will be necessary to examine more closely the English work to understand its weakness and its strength.



England: North Aisle of Choir, Cathedral of Carlisle, Cumberland.

Circa 1260, except the window at the [illegible] about 1450. The [illegible]

To trace the development of Gothic architecture in England, one must return for a moment to the work which preceded it, and see toward what it is leading.

The Romanesque builders, following the precedent of the Roman vault, determined the intersection of their vaults and the line of the ribs (where these were used) by the span of the arches. This system, where the arch was round, made the diagonal intersection, or diagonal rib, elliptic. The Gothic builders, at once grasping the full functional significance of the rib, and using the pointed arch to cover all discrepancies in span, determined the vault by the span of the diagonal rib. This, instead of being elliptic, was made generally a round arch, thus avoiding the great thrust of the elliptic. The emphasis thus laid upon the ribs of the vault was the keynote of Gothic work. This it was which produced the compound pier in its perfection. The pier on ground plan displayed the intention of the builder and indicated the supports for the transverse, diagonal, and longitudinal ribs.

It would, however, be misleading wholly to attribute the compound pier to the study of vaulting principles. Before rib vaulting was practised or understood, the Romanesque builders had recessed their arch opening with various orders, chiefly it would seem to admit more light and to give more pleasing reveals than the earlier square jamb ; and the recessed orders thus developed had their influence on the recessed orders of the pier, as they were adapted to the constructive requirements of the true Gothic vault.

It is difficult to say how far the true principles of Gothic construction were understood and appreciated by the English builders. Many buildings originally planned for vaults were left without that crowning glory ; many of the vaults that were built show, on the one hand, incompleteness in the actual constructive features, imperfect support for the ribs of the vaults, and an insufficient buttressing, or buttresses ill placed ; on the other hand a redundancy of seemingly constructive features, shafts which carry no ribs, ribs which have no functional place in the vault system.

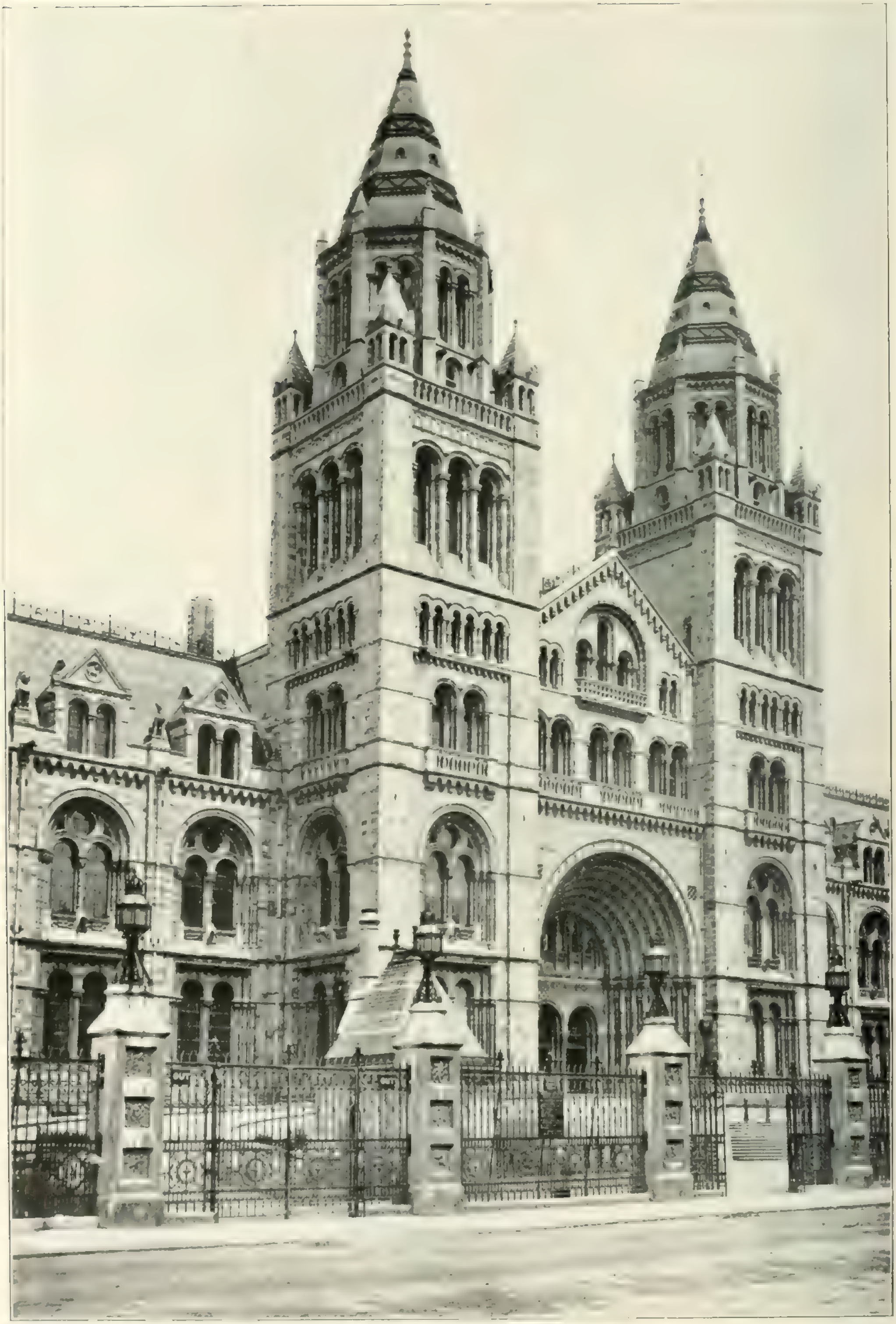
In all the architectural history of England one must be impressed by the fact that architecture as a science was not practised in England, but that as an art it called forth the best energies of the nation. With science thus partially divorced from art the higher results are unattainable. One will not find in England anything comparable to Amiens as a monument of Gothic art, but one will find innumerable examples which show a sufficient appreciation of the principles of Gothic art to lead towards results which are full of life and vigour, and above all of the spirit of beauty which underlies all good work of whatever style or country.

With the French, Gothic was a scientific building, and their superb abilities were directed, were concentrated, on the achievement of the perfectly balanced vault. To this end wall surfaces were deliberately abandoned, the mass and sky line were often sacrificed, but they won a deserved preëminence which is possible only for those who have a single aim.

The influence of the French gave the first inspiration for Gothic work, but hardly was this early work begun but it was affected by marked English traits ; parsimony, or at least carefulness as to expenditure, and carelessness as to the scientific questions of construction. Each had its disadvantages and its advantages. They led to the frequent omission of nave vaults, and this in turn gave us the noble timber roofs. They led to the avoidance of very lofty buildings, — which require great expenditure and great constructive ability, — and this in turn gave the long low vistas which have an inexpressible charm in the English cathedrals — not awe-inspiring like the soaring French vaults, yet none the less beautiful and reverential. They led to the multiplying of shafts and vaulting ribs which, although constructionally meaningless, yet gave us most beautiful results in the elaborate traceried vaults and carved bosses of the fourteenth century, and the still more complicated lacework of the fan vault. The comparative narrowness of the nave made practicable the tower at the crossing, and lowness of the nave accentuated and gave value to a moderate height in the tower. Sometimes the tower was crowned with spire as well. The tower at the crossing, or the tower and spire, the final glory of a Gothic building, received nowhere such development as it did in England, where, as has already been shown, it had long been a marked feature. Even the later perpendicular towers, such as those at Canterbury, or the still nobler towers which abound in Somerset, have great charm of proportion and outline, rising nobly from the immensely long body of the church, and contrasting well with the level ridge.

Again, this spirit referred to led to the almost entire discarding of the chevet, and in place of it we find the distinctively English square east end. When the square east end is increased in length by a lady chapel and the long chancel emphasized by double transepts, the nave finished with western towers and crowned with its central tower, one has a group which, however illogical and unscientific, is yet marvellously potent in its charm. Of the greater cathedrals there is hardly one but is fit subject for the painter from any point of view. If western towers are lost from the east end, the central tower yet remains dominant, and neither transepts nor tower are dwarfed by the western façade. Seen from every point Salisbury and Canterbury and Lincoln are perfect compositions.

French builders recognized the threefold plan, and terminated the nave with a wondrous portal and the aisles with vast towers. England almost invariably disregarded both plan and sections, and built her west fronts as screens, which masked, rather than expressed, the building behind. This was so false in principle as to destroy nearly all the merit that might otherwise lie in such a façade as Lincoln or



ENGLAND, ARCHITECTURE OF. PLATE IV

London; central pavilion of the Natural History Museum, at South Kensington; built about 1880 to receive the collections other than artistic and antiquarian of the British Museum. The architect was Alfred Waterhouse. The building is interesting because of the free use of terra cotta, both within and without. The whole front, including the end pavilion, is given as 675 feet.

Wells. Neither western nor transept porches play any great part in England. For the most part the doorways are comparatively small and insignificant, but they prepare the eye for the long and low interior.

Sculpture did not receive much attention, and was neither so well designed nor so well executed as in France. So much was this the case that in early work the capitals were often simply moulded. In fact, throughout mediæval work, line seems to have played a more important part than modelling. The love of many lines gave the moulded cap, the subdivided and overdivided shaft, the intricate network of the decorated vault and of fan tracery; and the moulding and panelling of perpendicular work.

The introduction of Purbeck marble and other similar stones undoubtedly increased the tendency toward the moulded cap and base; and the execution of these led to such complete mastery of the theory of mouldings as to encourage the display of this ability. Eventually it was overdone and one feels the false note. Just so did the French overdo their loved vaulting and produced the wonderful but false vault of Beauvais.

With the fifteenth century, when Italy was in the full flower of Renaissance, England was developing on new lines and doing work which for the first time was simply and solely English. The perpendicular phase of Gothic work was, except in the principles of the fan vault, no true style, for it embodied no new constructive principles, and, indeed, dropped many of the earlier and sounder principles. It was, therefore, rather a decorative phase than a style, but it lent itself most pliantly to the mingling of Renaissance ideas which gradually crept in from Italy. Furthermore, it was easily adapted to the domestic architecture, which was now receiving more and more attention.

To this last period of Gothic England is indebted for many of its most beautiful towers, for much very fine woodwork, for innumerable good small churches. Carving had lost much of its spirit and was more formal and lifeless than in the earlier work, and tracery had lost much in being confined to perpendicular lines — yet for all that there was much to be admired and much that has served as inspiration to some of the best modern work.

With the fifteenth century began in Italy the great movement in art and letters known as the Renaissance — the new birth to life. Such it was in truth in Italy; the long-forgotten work of Greece and Rome, its philosophy, its science, its poetry, its sculpture; and its architecture came once more to be recognized at their true value. So deep-seated and enthusiastic was this love of the antique, this worship of the beautiful, that the beauty inherent in the work which preceded Renaissance days was quite lost sight of.

It was impossible that such a movement, in the ecclesiastical centre of the civilized world, should occur without having its influence on England, and one cannot tell how this might have resulted if other circumstances had not intervened to sever the intimate relations between Rome and England.

The English Church, from its earliest days, coincident with the Roman occupation, had claimed independence from the Church of Rome, and, however perfectly it may have seemed in harmony with her during the earlier days of the Norman occupation, there was always an underlying spirit which revolted against foreign bishops and the rule of Rome. As the Norman kings became more and more essentially English, this spirit grew and increased. The wholly unworthy character of Henry VIII. and the unworthy cause by no means controvert the fact that he had the sentiment of the English nation with him when he refused to recognize the spiritual control of the Pope, and declared England ecclesiastically independent; nor does his wholly unjustifiable claim to be considered the head of the Church in any way injure the cause which he represented.

It was this break with Rome which effectually stopped the influence of the Italian Renaissance. Before the break came, Henry had imported, to work on his palace of Nonesuch, a large number of Italian workmen, and from the reports of Nonesuch, and also from a few sparse remains of that short period, we know that the Italians worked in the spirit of Italy, untouched and uninfluenced by the English work about them, which must, indeed, have seemed to their eyes even more rude and barbarous than the already condemned work of the Lombard period in Italy. As a striking example of this especial time none is more marked than Newton Ferrars, built at the end of the fifteenth century for an Italian cardinal. It is absolutely unlike the English work which is contemporary with it, and which is characteristic of early Tudor days. At first glance one would attribute it to the seventeenth century. The plan, the common H, is the one recognizable Tudor feature; there all resemblance ends. The windows are square without mullion or transom, there are no bays, no gables, no steep pitched roof; instead, a simple classic cornice and a low hipped roof. The grounds also, with their succession of terraces, — for the house is on a hillside, — are also Italian rather than English.

There is therefore no Renaissance in its true meaning in England; the spirit of classic revival neither in arts nor in letters had any great influence at that time nor until after the Italian Renaissance had passed its prime and sunk into a form of neoclassic, a distinctly decadent style.

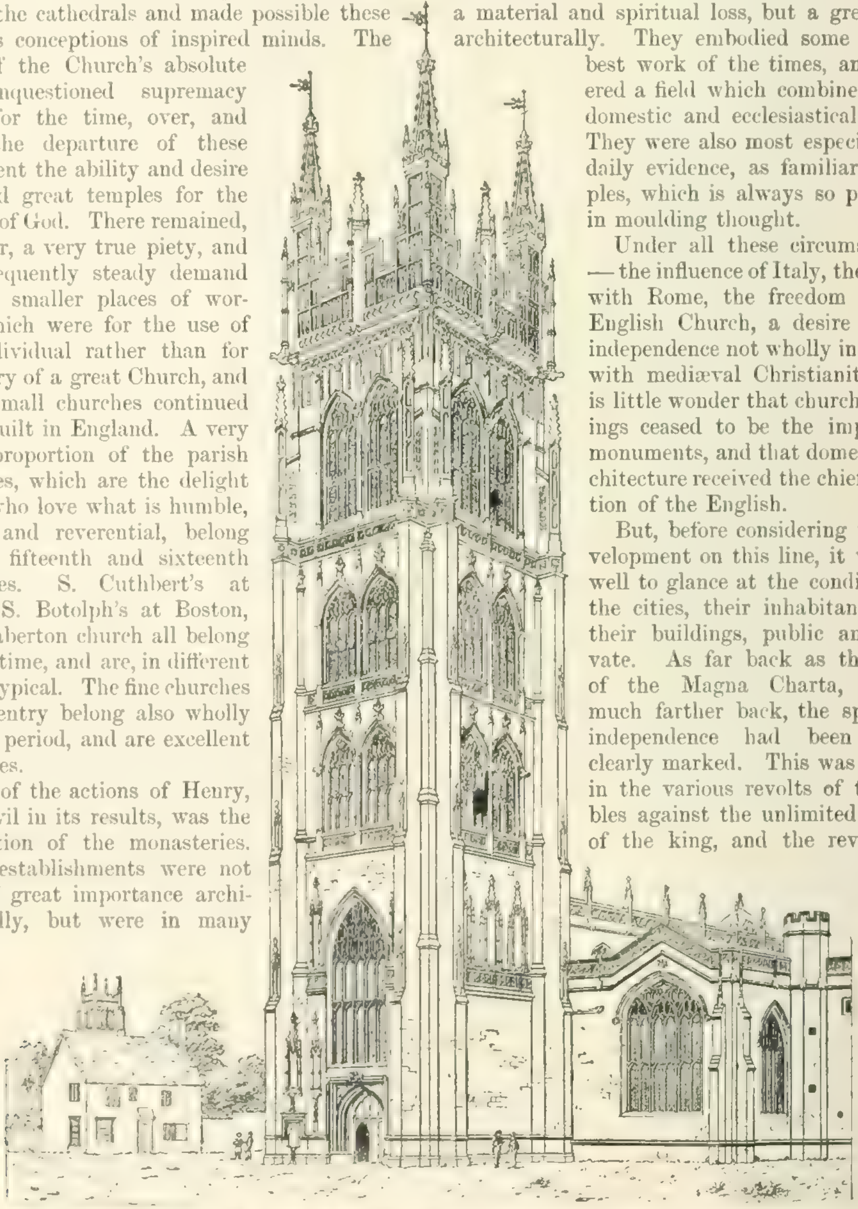
There is, however, no doubt but that Italy had its indirect influence; the little group of Italian artists, referred to above, left in many places traces of their handiwork which the English artisans were quick to imitate, and, although ecclesiastical intercourse with Rome was more or less broken, there was of course much travel on the part of the more highly educated. Thus Italian letters and arts had an indirect influence on the Tudor style which was the successor of the later styles of Gothic.

The break with Rome was but an incident showing a very general trend of thought quite opposed to the mediæval spirit which had reared the cathedrals and made possible these glorious conceptions of inspired minds. The days of the Church's absolute and unquestioned supremacy were, for the time, over, and with the departure of these days went the ability and desire to build great temples for the service of God. There remained, however, a very true piety, and a consequently steady demand for the smaller places of worship which were for the use of the individual rather than for the glory of a great Church, and many small churches continued to be built in England. A very large proportion of the parish churches, which are the delight of all who love what is humble, lowly, and reverential, belong to the fifteenth and sixteenth centuries. S. Cuthbert's at Wells, S. Botolph's at Boston, and Haberton church all belong to this time, and are, in different ways, typical. The fine churches of Coventry belong also wholly to this period, and are excellent examples.

One of the actions of Henry, most evil in its results, was the dissolution of the monasteries. These establishments were not only of great importance architecturally, but were in many ways the mainstays of the civilized life of the community. The value of the monastic houses in London can hardly be overestimated. They not only cared for the people in their spiritual needs, but they cared for them in sickness, in poverty, and in death. They were closely bound up with the great guilds, and served as the hotels, hospitals, almshouses, and burial societies of the whole city. One can hardly imagine the utter paralysis of London when these houses were destroyed. The London monasteries, though the most numerous congregation of houses, were but a small part of those scattered throughout the kingdom, and their destruction was not only a material and spiritual loss, but a great loss architecturally. They embodied some of the best work of the times, and covered a field which combined both domestic and ecclesiastical work. They were also most especially in daily evidence, as familiar examples, which is always so precious in moulding thought.

Under all these circumstances — the influence of Italy, the break with Rome, the freedom of the English Church, a desire for an independence not wholly in accord with mediæval Christianity — it is little wonder that church buildings ceased to be the important monuments, and that domestic architecture received the chief attention of the English.

But, before considering the development on this line, it will be well to glance at the condition of the cities, their inhabitants and their buildings, public and private. As far back as the days of the Magna Charta, indeed much farther back, the spirit of independence had been most clearly marked. This was shown in the various revolts of the nobles against the unlimited power of the king, and the revolts of



England: Church of S. Mary Magdalen at Taunton: Close of 15th Century.

the towns against the impositions of the nobility.

The earliest towns had been but the congregation of people about the household of some great lord. Gradually, as the people became more numerous, they became powerful, and gained from their overlords by force, or more often by purchase, rights and privileges which became at length the basis of town charters. The larger towns owed no allegiance but to the king, and one cannot read the history of England without being impressed with the power of London and her enormous influence on the growth of England, her strength, and her liberties. It is not so with Paris, nor do we find a parallel in the independent cities of north Italy. These had no interests which were broader than their own community. London was the heart of England, whose mighty throbbing made its beats felt in every part of the kingdom.

With the growth of the towns in power and independence began the growth of civic buildings. The monastic houses already referred to were still the important buildings, but the powerful merchants and city nobles, who stood shoulder to shoulder and on equal footing in these democratic days, were fairly close rivals of the ecclesiastics in architecture. The ruthless hand of Henry VIII., and still more ruthless fires, have left but little trace of mediæval London, yet enough to show that it was a city of palaces as well as of churches. The plan of the city house was more or less on the line of the country house. The great hall was the centre, and the rooms grouped around formed generally an open or a closed quadrangle. Besides these there were the great buildings of the guilds, which to a certain extent filled the place of the modern public buildings. The guilds regulated all the details of their respective trades and were responsible for law and order. They ruled and governed their members absolutely, and, although the apprentice, and still more the journeyman, was kept down with iron hand, he submitted readily enough with the prospect of working his way up some day to power and influence. The guilds were always staunch supporters and generous givers to the Church, but whatever could be spared from the Church went into the guild halls.

Such was the condition of architecture in England when the sixteenth century began, the great days of church building past, the nation quite out of touch with the movement now in its flower in Italy, and yet with a strong desire for building and a love of the beautiful which demanded expression.

It is but natural that the private house should receive the full benefit of this enthusiasm, for the Englishman through five centuries had been growing more and more attached to his home. The sanctity of the marriage tie and of the family, the best safeguards of a nation, were especially regarded in England. The laws of primogeniture insured the permanency of an estate once established. Associations then gathered about the home and made it a peculiarly hallowed spot. The majority of the great families in England had their real homes in the country, where they lived surrounded by a law-abiding tenantry, going to court and to town but occasionally — essentially different in this from the great Italian families, who made their homes in the cities, and different again from the French nobles, who had hardly at this time given up living in fortified castles, and who were often at enmity with their own tenants and villages, and often at war with their king.

The English surroundings were eminently adapted for the development of a type of house which should be in essentials what is needed for use in the present day. The plan had developed quite simply from the central hall, by sending out wings on either side, forming an open quadrangle, or, if doubled, the H plan. Frequently one wing contained kitchen and offices, and the other the living rooms of the family. The half-felt influence of Italy undoubtedly tended toward the regularity of the plan and a balance of parts, and Italy gave England the orders (used for many years with a very hazy idea of their true proportion); except for these two things there was but little to associate the sixteenth century work of England with the Renaissance of Italy, and it is somewhat misleading to speak of this and the succeeding two centuries as English Renaissance. They had neither the spirit nor the knowledge shown in Italy, but they had a charm all their own of which England may well be proud, and as for names, one may rest content that the name Tudor will always suggest pleasant associations with simple quiet dwellings, built substantially of brick or stone, unostentatious, comfortable (according to the standard of the day), set among lovely rural surroundings with gardens and terraces, alleys and walks, and all those sweet and lovely adjuncts which go to make the perfect country seat.

Gothic still remained a dominant influence; the windows were no longer pointed, but they were divided with mullions and transom, and, if semiclassic in the section of their mouldings, were wholly Gothic in their feeling. The screen of the great hall was designed with the orders as a basis, but the hall as a whole was none the less clearly in touch with the fourteenth century. The plaster ceilings, which were so marked a feature, were indeed learned from the Italians; but no Italian would have recognized his handiwork in the designs, which were none the less full of life and vigour and a strong decorative sense.

Charlton House and Burton Agnes are familiar examples selected from a host of buildings small and great which testify to the building activity and ability of the sixteenth century. Apethorpe shows the enclosed quadrangle in plan, Audley End and Aston are open quadrangles, Montacute is the H plan, later modified to a double E, — a plan attributed sometimes to a desire to please the great Queen, — and all have more or less clearly marked the forecourt, the base court, and the gardens.

Knole and Charlton House have beautiful examples of long galleries and richly modelled ceilings. Moyns Park has in profusion the great bays, and Cobham is an excellent example of gables and chimneys pleasingly breaking the sky line. Blicking and Hatfield have fine staircases. All this work — one sometimes has difficulty to remember — is contemporaneous with the Palazzo del Te and the Villa d'Este.

There is no lack of ambition toward the classic, merely a lack of perfect knowledge. The porch in the quadrangle of Cobham, the porch of Wroxton, and Cramborne Manor show how eagerly the classic ideas and orders were seized upon, and how lavishly and ignorantly they were used. Sometimes the most beautiful of the old work was ruthlessly destroyed to be thus bedizened with the new finery. It was not, however, all bad; Blicking and Bramshill are examples selected from many where the orders, if not faithfully classic, are yet intelligently used with an end in view which is well accomplished; and in most cases there is a certain picturesqueness of composition, which, in a measure, compensates for coarseness and extravagance.

One cannot leave this period without reference to the collegiate work. This, although domestic in character, had distinctive features dependent upon college life. The common hall is still the familiar domestic hall; but it is expanded and made more dignified. The chapel is but an enlarged oratory; yet there are among the college chapels buildings at once beautiful and reverential, and wholly unrivalled for their purpose.

It is not to be wondered at that with the sixteenth century the energy of England was so entirely absorbed by the domestic work. Everything tended to this result. The old days of perfect unquestioning faith and implicit obedience to the Church had passed away. The new learning, the study of classic literature, the advance in the sciences, the wide dissemination of books through the process of printing, all developed a critical spirit in the learned, and among the lower classes a rude awakening to a sense that the old beliefs were filled with error, and that they had been victims of imposition.

Neither the spirit nor the ready wealth were now present to erect the monuments which mark the Middle Ages, and all the energy which had been expended in these directions was now turned toward the building of houses.

At this time the Italian Renaissance had not only reached its full flower, but was actually declining; yet hardly more than its shadow is seen in England's architecture. Almost the only clear mark of its influence was in the profuse use of the orders, which is a tribute rather to the ambitions than to the knowledge of the builders. The forms of the buildings are still essentially Gothic, but the detail was based on classic.

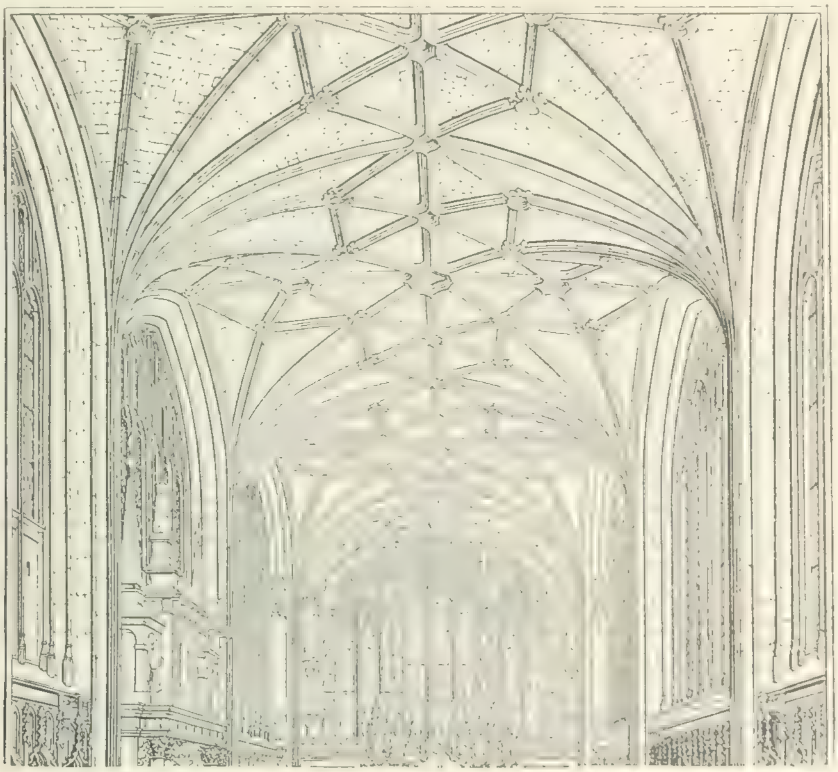
Not until the days of Inigo Jones and Wren was there any serious study of the architecture of the Italian Renaissance. Hitherto it was an indirect influence, a hearsay architecture. It is, perhaps, to the very fact of its being so distant and imperfect a reflection of the great movement that much of its charm is due; for the builders were forced to think for themselves, and use such knowledge as they had accidentally acquired in connection with their previous Gothic training.

With Jones and Wren began the days of Italian books, travels, and studies; and as the art of that country was more and more absorbed the distinctive English features were more and more obliterated. With them went many of the good qualities which had marked English work: its sobriety, its directness of purpose, its unambitious qualities, and its lack of pretentiousness. The new way reached its culmination in the superb, foolish, and wholly un-English work of Vanbrugh and the men of the early eighteenth century. The simple plan based on the needs of a country gentleman had given place to a plan which, at all hazards, must be symmetrical. The plan, so admirably suited for Italy, of a great square building with outlying wings connected by open arcades and corridors, was widely adopted. The climate, indeed, forced them to close the arcades; but the plan was popular, notwithstanding its unfitness for English life. To fill out a well-balanced plan like Holkham, where there were four outlying wings, was often a tax on the ingenuity of the architect; and after kitchen and offices and stables had been provided for, it was sometimes difficult to find uses for the third and fourth wings.

Holkham was by no means an isolated example; Castle Howard, Mereworth Castle, Houghton, are all plans quite as reasonable for meeting English needs. They are neither convenient and comfortable, nor so beautiful as to be a law to themselves. Of the later plans Blenheim is a superb example of folly seeking vaingloriously for fine effects, and neglecting wholly the fundamental aims of sound architecture.

If Mme. de Maintenon could exclaim of Louis XIV.'s work that everything was done for show and nothing for use and comfort, it might with equal justice be said of much of the grandest work done in England during this period.

If the work had been really magnificent, one might forgive its useless show, but both Italy and France could easily surpass England on these lines. In throwing over one set of principles and adopting another there is always the danger of losing what is good in the old, and exaggerating the new so as to do scant justice even to it. One can readily see how the men of the eighteenth century overemphasized their newly acquired and much-vaunted learning. These remarks apply exclusively to the more important architectural works of this period. The great bulk of smaller work contained the true English common sense and that appreciation of fitness which makes most English work worth careful study.



England: Beauchamp Chapel, Warwickshire; Late Perpendicular Vaulting, — the First Step toward Fan Vaulting.

Compare the plan of Aston hall with those of Wollaton and Stoke Park. In the first, one has the traditional English plan: — The hall flanked by its wings, the one for the offices, the other for the master's private rooms; an arrangement sensible, convenient, according to the standard of the time, beautiful both within and without, and quite free from any sign of affectation. In the second we have a plan where convenience is sacrificed for an external effect. The great hall, surrounded by rooms, depends for light on clerestory windows, and is disproportionately high. The rooms are ill planned and ill placed. The exterior, for which such sacrifices were made, is after all but a confused pile. This was designed at the same period as Aston, but had felt the influence of Italian study, and is distinctly a self-conscious effort. The third example is wholly Italian, a central building flanked by two pavilions which are connected with the main building by open colonnades. In one of these pavilions is the library, in the other the chapel. The plan is illogical, inconvenient, and wholly unsuited to England. In this particular instance there is the excuse that it was probably designed by a foreigner; but there is no such excuse for the many plans which were based on this, and deliberately designed for English needs. As a matter of fact many of the more important of the houses of this period were built, not for English needs, but to show the learning and undoubted ability of the designers. While such palaces were going up, the tradition of good domestic work was not neglected; and the houses of many a forgotten architect or builder remain to show us how lovely English country work has been at almost all periods of her history.

English architecture has been greatest when it has been a time of works rather than of men. The earlier days, the great Gothic times, are marked by buildings; the finest Elizabethan houses are by men practically unknown; with Jones and Wren we begin to hear about architects, and much of their work lacks the true ring. With Vanbrugh and Gibbs, and the Adams brothers, we hear a great deal of the architects — of the men who did the buildings — and the buildings themselves are pretty near second class.

In these very periods when men's names are much heard and talked about, the quietest and most charming work is by unknown men.

After the coming of William and Mary the Dutch brought with them a more perfect knowledge of brickwork. That wonderful country, the product of a continual strife both against natural forces and human foes, had contrived, notwithstanding this constant warfare, to keep a steady interest in art and an unvaryingly high standard of work. Stone was scarce and expensive, and with brick in nearly universal use the Dutch became experts in the manufacture and use of the latter material. The fine accurate brick which made true joints possible — and on which the modern face brick is a parody — was first used in England after the Dutch came over, and is closely associated with the moulded and carved red brickwork which is so generally connected with the name of Queen Anne.

The study of the Italian Renaissance had led to a more general study and knowledge of the classic sources, and by the end of the eighteenth century the orders and the various forms of classic work were sufficiently assimilated to have become almost household words in architecture. All trace of Gothic traditions had passed away, and we find classic receiving an English touch and flavour. In Wren's day the English architecture had received a classic touch, which, except in the larger masterpieces of Wren and Jones, was a very light touch indeed; in these eighteenth century days classic received an English touch, and the two are far apart.

Architectural books had now become common — they are still familiar to all architects, still standards in their way — *Vitruvius Britannicus*, Ware's *Complete Body of Architecture*, the books of the Adams brothers, and many others. These furnished good sound examples of ancient and modern work as precedents, and they furnished the basis of all the best Georgian work and the American colonial work of Virginia and New England.

Thus we come down to modern days. There is a somewhat unintelligible gap in English architectural history in the early Victorian era. The classic seemed to have palled, and there was nothing to take its place. The various movements in France found but faint echo in England, and the architectural enthusiasm of the Prince Consort hardly tended to elevate the general character of the buildings encouraged by him.

With the middle of the century there came a new era. Hitherto in all the movements which had successively followed each other and marked the changing styles of English architecture, it had always been a seeming advance from a less cultivated and refined, to a purer and more exact science. Each succession of builders or architects considered not only that they knew more than their predecessors, but that their predecessors' work was bad. The thirteenth century bishop, with great zeal, pulled to pieces the Romanesque church to rebuild it in the new style; with no less energy did the fifteenth century bishop destroy the thirteenth century work to make room for the new way. When the study of classic came to England, the Gothic, in its turn, was but a rude and barbarous style, and similarly Wren's work seemed poor and unlearned to his immediate successors.

With the gradual decline of classic work men began to doubt whether everything in the past was really bad or not. The Oxford movement was but one phase of a general searching into the more immediate past. As these men inquired whether anything precious had been left behind and lost when the connection with Rome was so hastily severed, so laymen interested in the Church and in architecture began to inquire whether there might not be something precious in the old church buildings. For the first time Gothic was seriously and carefully studied — never again to be despised. There had been, previous to this, a sort of bastard Gothic revival and attempts made to build on Gothic lines, which but served to cast more discredit on the old work; but this new study went to the root of the matter, for it was in the hands of men who knew and cared for the spirit which underlay and which had inspired the old work. As the Oxford movement brought out a healthy (though somewhat bitter) controversy with those who feared a return to Roman rule, so the little Gothic movement brought out the classicist in force, to the obvious benefit of both. All periods in the history of architecture were now studied, and many periods, very precious historically, were brought to light. The result of all this research is seen in the multiplicity — the terrible multiplicity — of styles now in use. Among them all there is, however, much that has the sterling ring of England's true metal. There is good sound Gothic, full of vigour and life; there is Gothic touched with the sixteenth century spirit and Italian detail. There is classic, as of Wren, in its simple robustness, there is Renaissance of Flanders and the Lowlands; occasionally some French Renaissance, — but not much, for England has never been much given to French ways. There is Tudor, Elizabethan, and Jacobean — all these and more in Victoria's days.

In summing up the characteristics of English architecture it is difficult to define with any certainty the traits which are essentially English. On strictly scholastic, constructional, or artistic grounds England has no claim to rank as one of the great architectural centres which have laid down precedents for the world.

Before Norman days there was no architecture. The work of the Normans in England was both structurally and artistically inferior to the great Romanesque of southern France. At best it was but an importation from Normandy, and little was added to the Continental model by English builders. The Gothic builders of England cannot claim any great part in the development of the vault and its supports, nor do we find in separate features, or in detail or ornament, anything comparable to the great masterpieces of France. The days of the Italian Renaissance brought no new life to England; not only did she add nothing to the growth of the movement, but she was actually unable to march in the line of its progress.

It would seem as if, in making these statements, one were taking from England all claim to merit in her architecture; but there is a subtle quality which is concerned neither with question of construction nor with the laws of art, which is yet a necessary accompaniment of perfect quality in either. This quality is almost undefinable; one feels its presence and is affected by it without being able to determine what its elements are. It is the expression of a certain straightforward honesty of purpose, a simplicity — perhaps almost *naïf* — which appeals directly to the heart rather than to the judgment and reason. This quality is always inherent in the very best work; and, if present in other work which one's trained judgment condemns, it may quite redeem it. It is this quality which preëminently marks the English work and makes it so lovable. With all the wonderful beauty of Beauvais, we feel the lack of this quality, emphasized by the false bearings and the appearance almost of legerdemain in the skill which supports the great vaults. When the English content themselves with simpler problems they lose indeed the glory of having nobly attempted great things, but they gain a more perfect success in the humbler effort. Thus it is that English cathedrals find their chief charm in their great length, — for which no such courage is required as for height and span, — in lofty towers, which gain from the comparatively low nave, and finally in their beautiful settings and surroundings.

It is for the very reasons that have been pointed out above that the English have found their most perfect success in the humbler and less ambitious buildings, and that the small churches are so invariably charming, and that the large buildings, especially those on classic lines, are so often lacking in interest, and so generally inferior to Italian and French work.

Notwithstanding shortcomings and faults, no country contains in itself a more precious architectural heritage than England; for, if it teaches no great lessons of art, it is yet instinct with all those qualities that have made England great; and every stone tells the history of a people who for all time have stood for freedom and justice, for honesty and uprightness.

Their houses speak of that home life which has been the underlying strength of its people, their churches tell of the struggle for truth, their municipal buildings tell of the dignity and freedom of the people who have built their great cities, and made England strong and powerful for good. Such a record is worthy to stand side by side with the greatest.

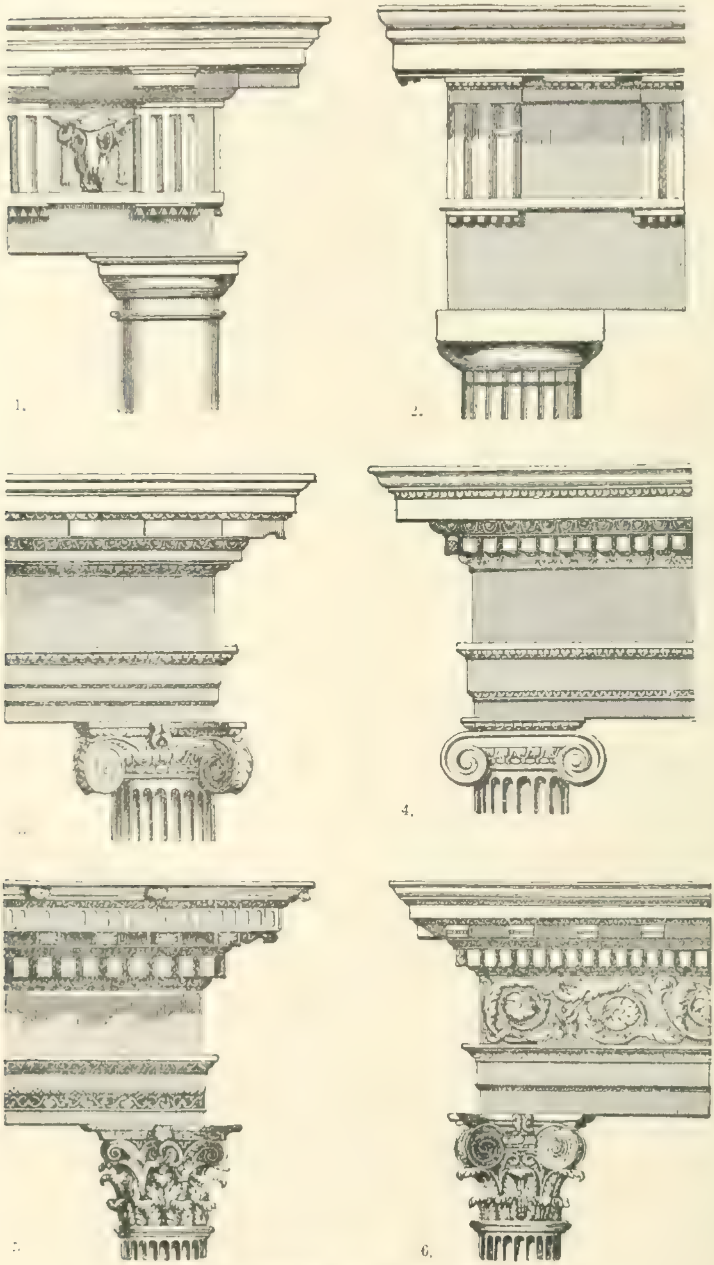
— R. Clipston Sturgis.

English architecture has not been made the subject of complete treatises. In a general treatise by an Englishman, such as that of Fergusson, it receives proportionately full treatment; and much of Sir Gilbert Scott's *Lectures on Mediæval Architecture* is based upon English work. Moore's *Gothic Architecture* and Gonse's *L'Art Gothique* treat English Gothic architecture as derived from that of France, in accordance with the views expressed in the articles of this Dictionary; but the later Gothic buildings are neglected by both these writers, and the important Perpendicular style, fan vaulting, etc., have had no historian. The early volumes of plates (see biographies of Billings and Britton) should be used; those of Billings being especially important. Bell's Handbooks of English Cathedrals and other churches (the Cathedral Series now — 1900 — in course of publication) are full of valuable matter. For the Elizabethan and later styles, there are several very recent books of great importance: Blomfield, *English Renaissance*; Gotch and Brown, *Architecture of the Renaissance in England*; Belcher and Macartney, *Later Renaissance Architecture in England*; and Birch, *London Churches of the Seventeenth and Eighteenth Centuries*. The last named three consist mainly of large photographic plates. The recently published work by Feasey, and others, on Westminster Abbey is in like manner illustrated by large collotype plates. — R. S.

ENGLISH GARDEN. *A.* Same as Jardin Anglais; hardly used in English except as a translation of the French, or by way of deliberate contrast with the formal garden.

B. With the definite article, a park in Munich, Bavaria, of about 600 acres, and laid out in large unbroken lawns, surrounded each by dense groves of trees, now of great size and beauty. The drives and walks are usually screened by the trees so that the great lawns show an unbroken sward. A branch of the Iser is carried through the park in three canalized arms, in which the water runs swiftly. It is one of the most beautiful parks in Europe.

ENGRAILED. Scalloped with concave lines; cut along the edge with a series of small concave curves, usually of the same size. The term is especially of heraldic use.



Entablatures of Six Classic Orders.

1. Tuscan.
2. Grecian Doric.
3. Ionic, Roman Modification.
4. Ionic, Greek type.
5. Corinthian.
6. Composite.

ENGRAVING. The art and practice of making incisions in a hard material with a sharp tool. By extension, the producing of a similar effect by a mordant liquid (as in etching); but the term is restricted to such sinkings as are produced by the taking away of a solid material, being distinguished in this from chasing. In architectural practice, engraving has to do with memorial brasses and bronze plates, such as are let into the pedestals of statues or, if decorative, on the walls of buildings, where they are used especially for record; and equally for incised work in stone, which, however, when limited to lettering, is more often called inscription.

ENNEASTYLAR; -STYLE. Consisting of nine columns, as a portico; having a row, or rows, of nine columns at one or each end; said of a temple-like structure, as the so-called Basilica of Pæstum in Italy. (See Columnar Architecture.)

ENNEASTYLOS. An enneastyle building. The term is modern, made up to correspond with hexastylos, oktastylos, etc.

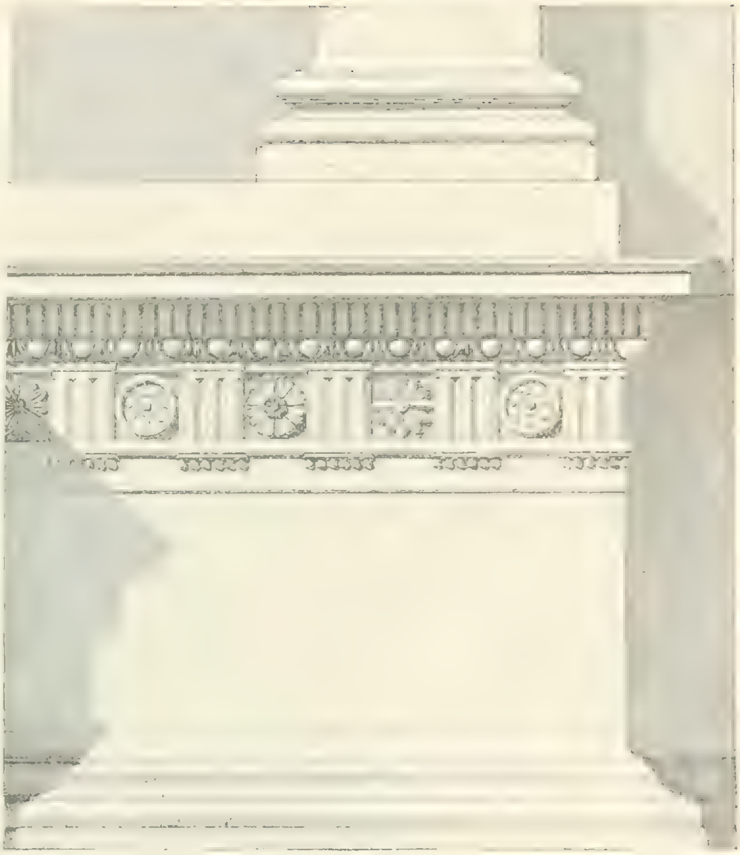
ENSINGEN, MATHIAS VON. (See Mathias von Ensingen.)

ENSINGEN, MORIZ VON. (See Moriz von Ensingen.)

ENSINGEN, ULRICH VON. (See Ulrich von Ensingen.)

EN SUITE. (See Suite.)

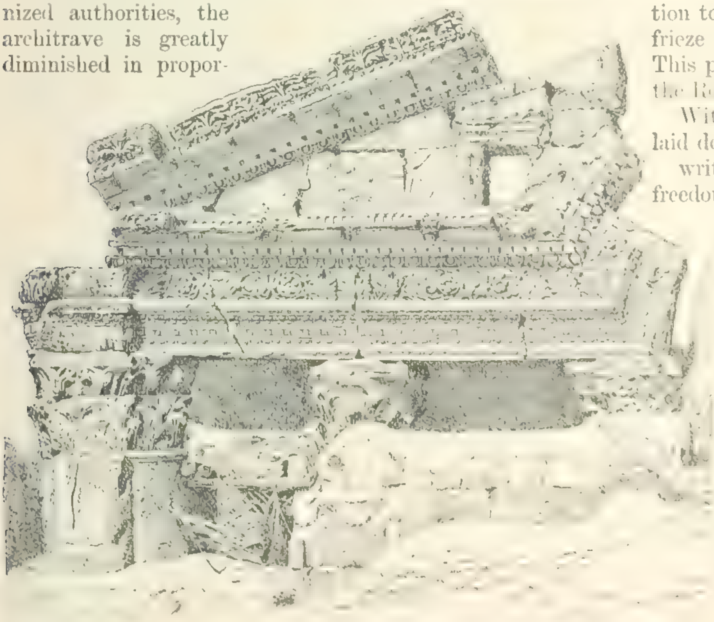
ENTABLATURE. In Grecian, Greco-Roman and neoclassic architecture, the whole horizontal mass of material carried upon the columns and extending upward as far as, and including, the first decidedly projecting course of material, drip moulding, or the like. It is always divided into three parts, succeeding one another vertically, except that a few very exceptional buildings, or parts of buildings, generally small and elaborate in their decorative treatment, may dispense with one of these parts. The architrave or epistyle is the lintel course which rests immediately upon the abaci of the columns; upon this rests the frieze, which in Doric architecture is divided into the alternative members, called triglyphs and metopes, and upon this rests the cornice. This uppermost member is the front or exterior face of the horizontal course of stones which is supposed to take the beams of the roof and also the gutter which receives the roof water. Where there is no real structure of the sort, and the order is a mere decoration, the parts succeed one another in exactly the same manner, whether the upright members are columns, engaged columns, pilasters, or a wall.



Entablature of a Podium, Interior Stylobate, Basilica of the Ancient Præneste (now Palestrina), Italy.

In some varieties of the orders, even as admitted by the recognized authorities, the architrave is greatly diminished in proportion to the other members, and the frieze is proportionally widened. This peculiarity occurs especially in the Roman form of the Doric order.

Within the strict regulations laid down by the sixteenth century writers, there are many minor freedoms allowed the designer; thus in the Roman Doric order, the architrave is often divided horizontally into two fascias, though more often left plain. So in the Ionic order there are more usually three fascias, and this [illegible] is repeated in the Corinthian order, but with the offset between the fascias moulded, or even more richly sculptured; while [illegible]



Entablature of Late Roman Epoch, bent around an Arch, Found in Damascus, Syria.

also vary; and the placing of the triglyphs in the frieze of the Doric order may follow more or less closely the original Greek distribution.

— R. S.

ENTABLEMENT. Same as Entablature.

ENTASIS. A convex curvature added to the taper of the shaft of a column in the Greek, Greco-Roman, or neoclassic style; or to the apparently vertical sides of a tower, or the generally conical or pyramidal shape of a spire. This is one of those Refinements in Design (which see) which were hardly recognized by students before the present epoch of minute examination and comparison. The entasis of Greek columns was noticed early in the present century, and the measurements chiefly conducted by Charles Robert Cockerell, who first established the fact of its existence, and fixed its apparent dimensions. The first edition of Penrose's remarkable work, *The Principles of Athenian Architecture*, in 1854, brought the subject to the notice of architects and antiquarians generally. His drawings, very carefully engraved, made it clear that the swell of the entasis in the columns of the Parthenon did not exceed $\frac{3}{8}$ of an inch on one side; this being applied to a shaft 7 feet in diameter at the base, and 34 feet high. From that time, the term has been chiefly applied to the swells in the shafts of classical architecture. It is generally held that this curve should be imperceptible to the eye; but even if this be a correct view, and if good taste requires that the entasis should not announce itself to a hasty observer, it does not follow that its purpose is to correct a tendency of straight lines to look hollow under certain circumstances. (See the article referred to above for the contrary theory.) It appears that an effect which is agreeable to the eye without further explanation of its remote cause, is enough to account for the free use of the entasis among builders who are following natural and wholesome traditions. — R. S.

ENTERCLOSE. *A.* Anciently, a passage connecting two apartments, as leading from a hall to the door of a neighbouring room. — (C. D.)

B. Anciently, a screen or partition. — (N. E. D.) (Compare Spier.)

ENTRANCE. (For terms relating to the doors and passages affording entrance to a building, see Atrium, *B*; Avenue; Court; Cour d'Honneur; Dégagement; Entry; Epinaos; Fauces; Forecourt; Front Door; Hall; Lobby; Porch; Posticum; Prodomos; Pronaos; Prothyron; Vestibule; Vestibulum.)

ENTRANCE HALL. A passage, corridor, or other interior division of a building into which a visitor enters from the outer air; especially (1) that which connects with the principal entrance door; (2) that which succeeds the outside vestibule, if there is such a division. Thus, if there is first a small square or rounded division not much wider than the doorway of entrance, and this is succeeded by a much larger division of any shape, the first would be the vestibule and the second the entrance hall. (See Hall.)

ENTRESOL. In French, an intermediate story or *mezzanine*. The term is generally confined to such a low story intermediate between the ground floor (*rez-de-chaussée*) and the *premier étage*, or first chief story, and usually treated externally as a subdivision of one lofty ground story. It is in French city houses devoted ordinarily to subordinate apartments. (Written also, in English, *entersole.*) Very frequently occupied by the occupant of a store below.

ENTRY. Originally, that part of a building by which access was had to its interior. Used indifferently for the doorway itself, the passage to which it leads, the outer porch, or all together; as in *Macbeth*, II., 1: "I hear a knocking . . . at the south entry." Later: —

A. In England, an alley or unimportant street leading to another street or public place.

B. In the United States (perhaps local), a passage in a house; more usually the principal passage leading from the front door, but frequently any passage, and even a staircase hall.

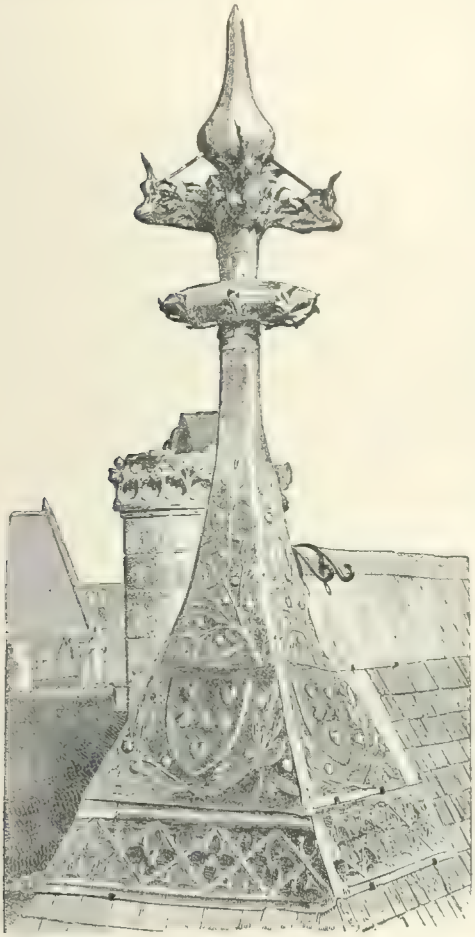
EOSANDER, JOHANN FRIEDRICH; architect; b. 1670, in Gothland, Sweden; d. 1729, at Dresden.

Eosander travelled in Italy and France, and, in 1699, settled in Berlin as court architect of the Elector Friedrich III., of Brandenburg. He was a rival of Andreas Schlüter (see Schlüter, Andreas), and superseded him as director of the works at the royal palace (Schloss) in Berlin. He enlarged Charlottenburg, and built Monbijou, Schönhausen (1704), and Oranienburg (1706–1709), near Berlin. In 1704 Eosander served as ambassador of the court of Berlin to Carl XII. of Poland. In 1722 he served as general lieutenant in the army of Saxony.

Seubert, *Künstler-lexicon*; Lubke, *Geschichte des Barockstiles in Deutschland.*

EPHEBEION; –EUM. In Greek archæology, a place for the youths (*epheboi*) to exercise; hence, in Greco-Roman archæology, any place for gymnastic exercises, as in connection with Roman thermæ.

ÉPI. In French, the spire-shaped termination of a projecting point, as of a roof, and comprising the construction by rafters and a central post. Elaborately framed hipped roofs commonly require for their proper construction an upright timber at the point where the hip rafters meet, which should be carried up above the horizontal ridge, and this culminating point is especially that which is the *épi*. In English, the adornment of such a point. Usually these decorations are made of metal, as of lead during the Middle Ages, and still in England; of copper in the United States; but at some epochs in the history of mediæval and revived classical architecture, terra-cotta or faience has been used, and a splendid effect of colour obtained in this way. — R. S.



Épi: Wrought Lead; House of Jacques Cœur, Bourges.

EPINAOS. In Grecian archæology, a back vestibule, as of a temple; opposed to Pronaos. (See Opisthodomus; Posticum.)

EPISCENIUM; EPISCENOS. In classical archæology, the architectural structure back of the stage of a theatre, and which formed a permanent scene. In some cases a part only of such a structure.

EPISCOPAL CHAPEL. *A.* In the British Isles, a chapel connected with the Established Church, as in five cases cited by the *Arch. Pub. Soc. Dictionary*; viz., 1, any place of worship, not a church, belonging to the English Church; 2, any place of worship of the Anglican Church in Scotland (and presumably of the Episcopal Church of Scotland); 3, a chapel of ease; 4, a chapel consecrated by a bishop for the relief of a crowded district, or the like; 5, the chapel of an Episcopal palace.

B. A chapel of the Protestant Episcopal Church in the United States of America. Such are common in very large parishes; thus Trinity Church parish in New York has (1900) eight chapels, most of which are large religious buildings; such as the well-known old churches of S. Paul and S. John, and Trinity Chapel, built by Richard Upjohn about 1858. — R. S.

EPISCOPAL PALACE. The official residence of a bishop; generally connected with, or very near, the cathedral church of his diocese. Buildings of this character exist in most of the cathedral towns of the continent of Europe, and are sometimes large and of great splendour.

EPISTATON (pl. epistata). In Grecian archæology, the entablature, or, in some cases, all the mass of masonry above the capitals of a colonnade.

EPISTLE SIDE. That side, as of a choir or sacred enclosure, from which the Epistle is read, the Gospel being read from the other; in either case from an ambon or reading desk; also of an altar, the distinction being made in the same way. This is properly the right-hand side as one faces the altar. There are occasional exceptions. (See Ambo.)

EPISTYLAR. Pertaining to, resembling, or characterized by an architrave or epistyle.

EPISTYLAR ARCUATION. Arched construction spanning the intervals between columns; either by the construction of the epistyle as a flat arch instead of a beam of stone, or by a relieving arch immediately above the epistyle and included in the height of the entablature. An arcade of the more usual kind would not be called by this name.

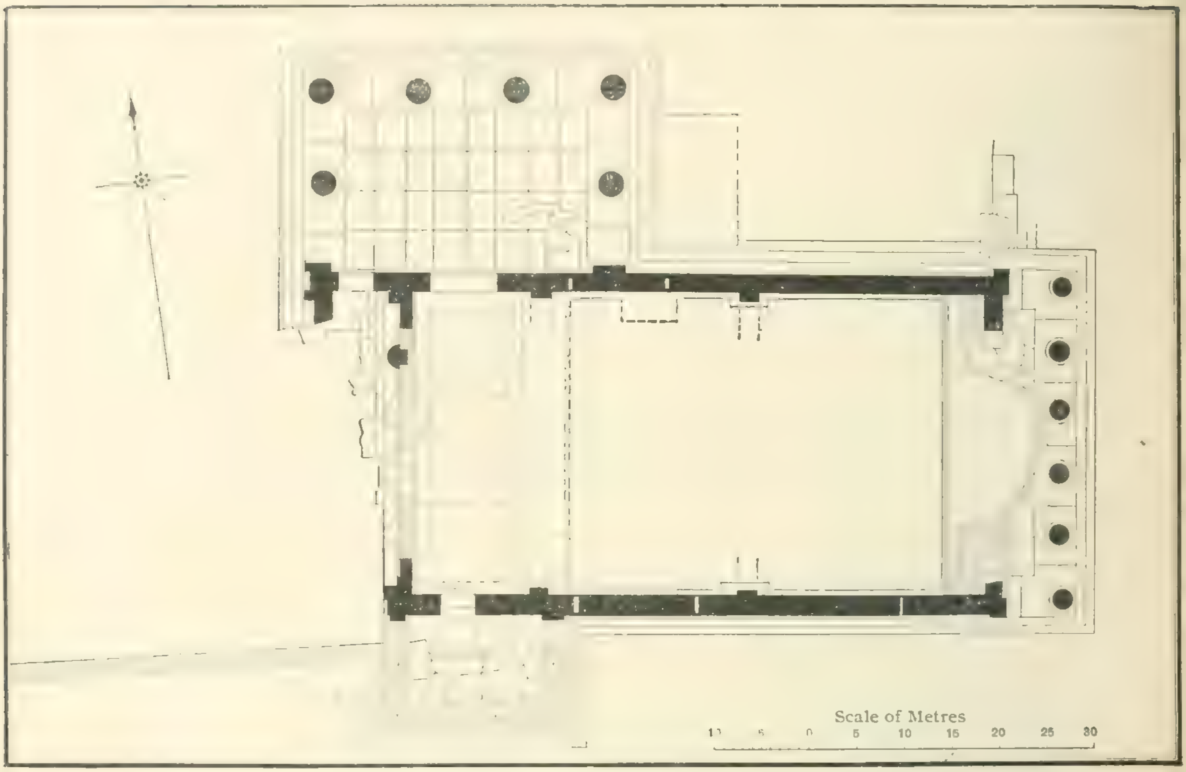
EPISTYLE. An architrave borne by columns; *i.e.* a beam of stone, or in rare instances of wood, spanning from column to column or from column to wall, supporting the frieze and forming the lowest member of a classic entablature.

EPISTYLIUM. An architrave; the word used by Vitruvius. (See Epistyle.)

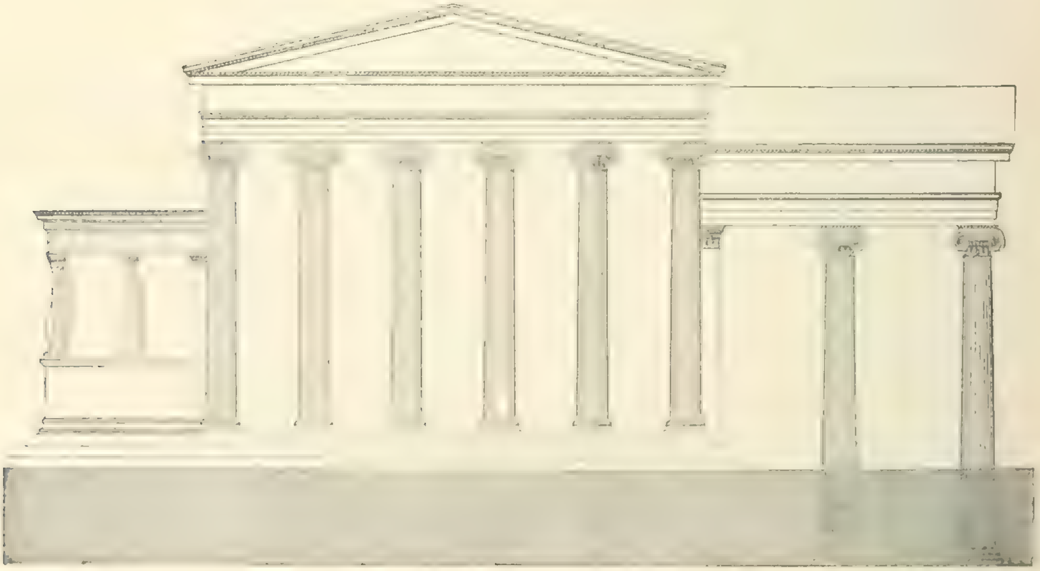
E PLAN. That especial plan, as for a large country house, whose general outline resembles the capital letter E. It is attained by arranging two larger pavilions at the two ends of the main building and a smaller one halfway between them; although in English country houses the end pavilions have rather the aspect of breaks in the main building which seems to be returned at right angles at either end, the lines of cornice, roof, etc., being continuous or nearly so. It has been thought that this plan was sometimes used in compliment to Queen Elizabeth.

ÉPURE. In French, a full-size diagram worked out on a floor, wall, or other large surface, from which are traced the patterns or templets for vault stones, stair rails, hip rafters, etc.

EQUILIBRIUM. The state of repose of a body under the application of forces which mutually counteract each other. — W. R. H.



Erechtheum: Ground Plan of Existing Remains.



Erechtheum: Restored East Elevation.

[illegible] The south porch with caryatides is the famous Pandrosium

ERDE HOUSE. Same as Earth House.

ERECHTHEUM; –ION. A temple or group of temples on the Acropolis at Athens. The most important monument of the Ionic style known to us, and having the most successful application of caryatides. (Cuts, cols. 923, 924.)

EREMACAUSIS. The slow process of combustion of a material, taking place by the combination of certain elements with the oxygen of the air or water, as the decay of wood. (See Dry Rot; Disintegration.)

ERGASTERION. In Greek archæology, a workshop, the term having the large significance of the French *atelier*. In modern Greek, applied especially to an establishment of some importance maintained by the government or by an association.

ERGASTULUM. In Roman archæology (the term being derived from the Greek), a place of confinement; serving also as a workshop; originally such a place used for slaves who had offended or were considered untrustworthy.

ERLACH, FISCHER VON. (See Fischer von Erlach.)

ERNULF; monk and architect; d. 1124.

About 1080 Ernulf, a French monk, was charged by Lanfranc, Archbishop of Canterbury (England), with the construction of one of the chapels of the first cathedral of that city. After the death of Lanfranc, in 1089, he was made archbishop of Canterbury.

Bauchal, *Dictionnaire;* Britton, *Architectural Antiquities.*

ERWIN VON STEINBACH (I.); architect.

When Conrad von Lichtenberg became bishop of Strasburg (Elsass, Germany), in February, 1273, his cathedral still lacked the façade. An inscription which existed on the left portal until 1720 ascribes the commencement of the work to Erwin von Steinbach. The first stone was laid May 25, 1277. His plan included only the two lower stories of the façade with the rose window. The great screen of the third story was a later addition. The spire was finished by Hans Hultz (see Hultz, H.) of Cologne in 1439. Erwin restored the nave after the great fire of Aug. 14, 1298. He designed the Chapel of the Virgin (finished 1316, destroyed 1681), and probably designed the tomb of Bishop Conrad. He was succeeded by his sons, Erwin (II.) and Hans (Jean) called Winlin.

Gerard, *Les Artistes de l'Alsace.*

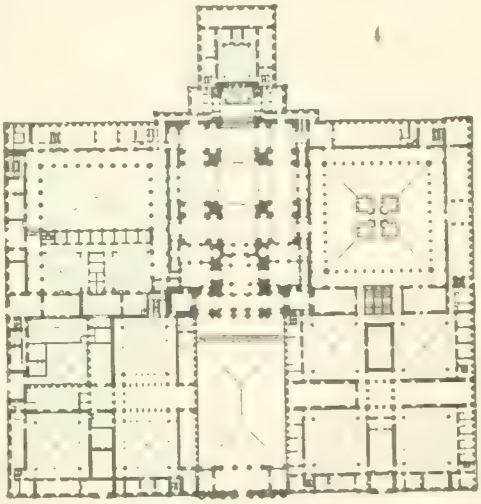
ERWIN VON STEINBACH (II.); architect.

The successor of Erwin von Steinbach (I.) (see Erwin von Steinbach, I.) as architect of Strasburg cathedral was probably his son Erwin (II.), who served from 1318 until some time after 1339. He was probably in turn succeeded by his younger brother Hans (Jean) called Winlin. It is impossible now to determine how much of the work is due to them, but it doubtless included the completion of the great rose window and the lower stories of the towers.

Gerard, *Les Artistes de l'Alsace.*

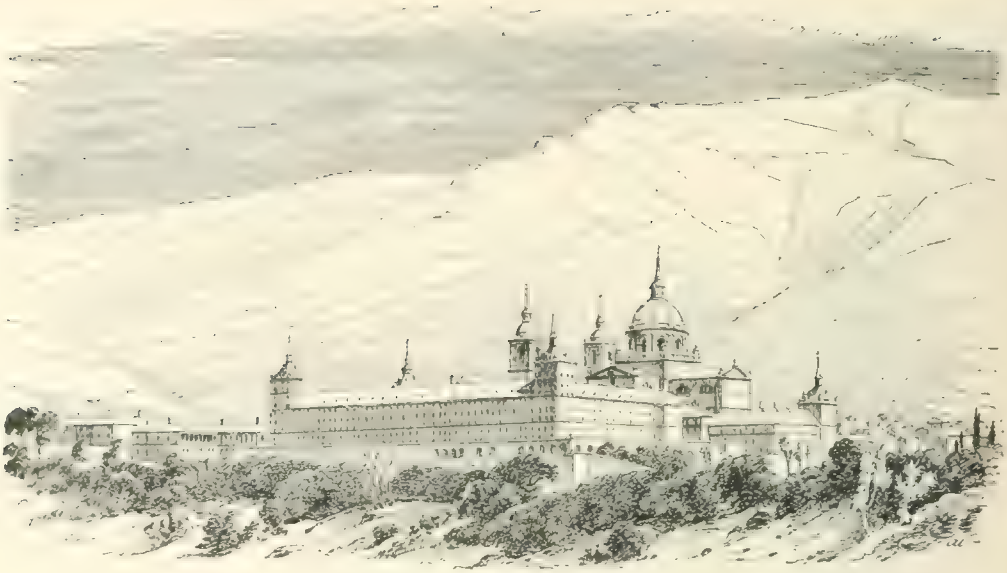
ESCAPE. A doorway or a passage, private stairway, or the like, or all together; the object being to afford private exit to a person who desires not to be found in his office or private room while he is yet supposed to be there. A high official will often desire to avoid persons whom he knows to be in his antechamber, and requires, therefore, a means of unobserved exit.

ESCORIAL; ESCURIAL. A palace of the kings of Spain, built by Philip II. in the sixteenth century. Its proper name is the Royal Country Seat of S. Lorenzo of the Escorial. It is one of the largest groups of buildings in the world, about 580 by 750 feet, and, although of necessity having courts within, that area is very solidly built over, the church alone being of very great size. (Cut, cols. 927, 928.)



Escorial: General Plan

ESCUTCHEON. *A.* In heraldry, the surface upon which are charged the devices borne by any one as peculiar and distinctive to him. The form of the escutcheon is generally shield-like, affecting the outline of the knight's shield as employed at any epoch; but, in the careless art of the seventeenth and eighteenth centuries, it is often an oval and [illegible] scrollwork, [illegible] is [illegible] shield is applied to the escutcheon in colour; but it has been recognized at all epochs that a slight relief may be made to assist the picture; thus, a cross or bar charged upon an escutcheon may be represented in relief by very slight



ESCORIAL. (SEE PLAN.)

relief from the surface or field of the escutcheon, — a relief only sufficient to cast a slight shadow at its edge. (See Arms.)

B. By extension, from the above definition, a small plate or the like, generally of metal and more or less ornamental, used for many specific purposes; as about a keyhole to protect the edges and pierced to admit the key; or inscribed with a name or number as a doorplate. — R. S.

E-SHAPED. Having a ground plan in the general form of the capital letter E. (See E Plan.)

ESKIMO ARCHITECTURE. That of the tribes occupying the polar shores and regions of North America, and to a limited extent Siberia, who are called Eskimos or Esquimaux. (See Iglu; Iglugeak; Karmang; Snow House; Tupik.)

ESONARTHEX. The inner narthex in cases where there is also an outer or exonarthex.

ESPAGNOLETTE. A contrivance for locking casements or French windows, doors, and the like, by means of long rods sunk in or attached to the inner face of the meeting stile, and operated by turning a handle or key. The rod is continuous, and, being turned by the handle, its hooked ends are engaged in catches in sill and lintel. The fastening by means of bolts which enter or leave mortises in sill and lintel when protruded or withdrawn by a rack and pinion operated by a knob, is rather a form of crossbolt lock than an espagnolette, although the term has been extended, in common usage, to cover these as well. Called also Espagnolette Bolt.

ESPLANADE. A large open space, as in front of a public building; differing from a public square in that it especially belongs to, or is intended to set off, the building which fronts upon it. The treatment of an esplanade is necessarily somewhat elaborate; it needs to be planted with trees and laid out in promenades, or else paved throughout its whole extent, and it may be surrounded by a parapet and approached by a perron. One of the largest esplanades in Europe is that in front of the Hôtel des Invalides in Paris, reaching from the Seine to the front of the principal structure, a distance of a third of a mile, while its width is about half as great. — R. S.

ESSENWEIN, AUGUST OTTMAR; architect and archaeologist; b. 1831; d. Oct. 13, 1892.

Essenwein made a special study of Romanesque architecture. From 1856 to 1860 he worked at first in Vienna and afterward in Gratz (Austria). In 1866 he was appointed director of the Germanic museum in Nürnberg (Germany). He enlarged the old monastery in which the museum is located, and restored many mediæval churches in Nürnberg, Cologne, Bonn, and elsewhere. He published *Die Mittelalterlichen Kunstdenkmale der Stadt Krakau* (Leipzig, 1869, 1 vol. 4to.); *Norddeutschlands Backsteinbau im Mittelalter* (Karlsruhe, 1855, 1 vol. folio); *Kunst- und Kulturgeschichtliche Denkmale des Germanischen Nazional Museums* (Leipzig, 1877, 1 vol. folio). He edited many handbooks for the Germanic Museum and made several important contributions to the *Handbuch der Architektur.*

Nekrologie in *Kunstchronik*, Oct. 20, 1892.

ESTANCIA. A South American cattle ranch; hence, the buildings of such a ranch.

ESTEVE Y BONET, JOSÉ; sculptor; d. Feb., 1791 (at Valencia, Spain).

He studied sculpture at the Academia de S. Carlos (Valencia) and with the sculptor, D. Ignacio Vergara (see Vergara, Ig.). In 1781 he was appointed professor of sculpture, and, in December of the same year, director general of the School of the Fine Arts. A long list of his works, chiefly on the decoration of churches, is given by Viñaza.

Viñaza, *Adiciones al Diccionario histórico.*

ESTIMATING. The process of judging and forming an opinion of anything in advance of proof: in architecture, the determination of the value of a building or other structure from the drawings and specifications or other preliminaries.

There are various ways of arriving at this end, and generally their accuracy is in proportion to their thoroughness in detail. The methods of builders in estimating for proposals (the lowest of which will usually be accepted and become a contract) are the most accurate. In this the various items (see Bill of Quantities) are priced according to the experience and judgment of the builder. Sometimes the contractor in each trade makes a subestimate, and finally all the trades are combined in a summary of totals, and the grand total, with profit and general charges added, becomes the proposal or bid. Skill in estimating depends upon a due appreciation of values, which are modified by variable markets of materials and labour; and by local conditions of accessibility, weather, haste, and other matters.

Among architects a method frequently used is the "cubic foot measurement." This, when properly applied, is accurate and reliable. The price per foot is decided upon by reference to the known cost of similar buildings in similar locations, with the addition or deduction of proper amounts for features newly presented or omitted.

The basis of a good estimate is observation of precedent. This is equally true of the complex and of the simple methods of estimating. The preparation of a schedule of items is mere clerical work; the determination of the price per unit of measurement is the essential thing, and a price based upon a mere opinion is often delusive. Therefore precedent should be followed even when only partially applicable. For example: If an office building of usual equipment has cost 26½ cents per foot complete with one stone front, this known price may be used for an estimate for a building somewhat similar, but with three stone fronts, by pricing the cubic size at 26½ cents and adding the value of the extra stonework in comparative amount.

It is evident that interior structures of floors and partitions of similar usual kind, at similar usual distances, are of similar value per cubic foot. Hence, all buildings having this similarity of features, from the twenty-story office building to the two-story wooden cottage, may be so estimated. But many edifices have not this character; churches and museums, for instance, have walls which enclose spaces varying much in proportions; and for such buildings the cubic foot estimate is unreliable. A better method in these cases is to make a detailed estimate of one of the bays or subdivisions which generally characterize such a design, and multiply it as required, and add for extra features. Another method, good, but not generally used, is to take the cubic measurement of the solids of walls, floors, roofs, etc., and price by a figure obtained in a similar way from an existing building. Churches are sometimes roughly estimated, by the accommodation, since edifices of similar proportions of width to height will vary in size and cost, very nearly as the number of seats contained by them; but this affords a very indefinite estimate.

Small houses are often estimated by the foot superficial of ground covered; but this is only another form of the cube estimate presuming a practical similarity in height. (See Cost of Buildings.) — ROBERT W. GIBSON.

ESTOUTEVILLE, GUILLAUME D'; cardinal, abbot, and architect; d. 1482.

After 1450 he built, or caused to be built, part of the abbey of Mont St. Michel on the coast of Normandy, as it exists to-day.

Corroyer, *Description du Mont Saint-Michel.*

ESTRADE. A platform or dais; primarily one destined to receive a throne or bed of state, and hence any space reserved for such purpose, whether raised or not. It is now also applied to any raised platform for a desk, for a band of music, or for other like purposes, but not to the stage of a theatre or music hall.

ESTRIA, HENRY DE. (See Henry de Estria.)

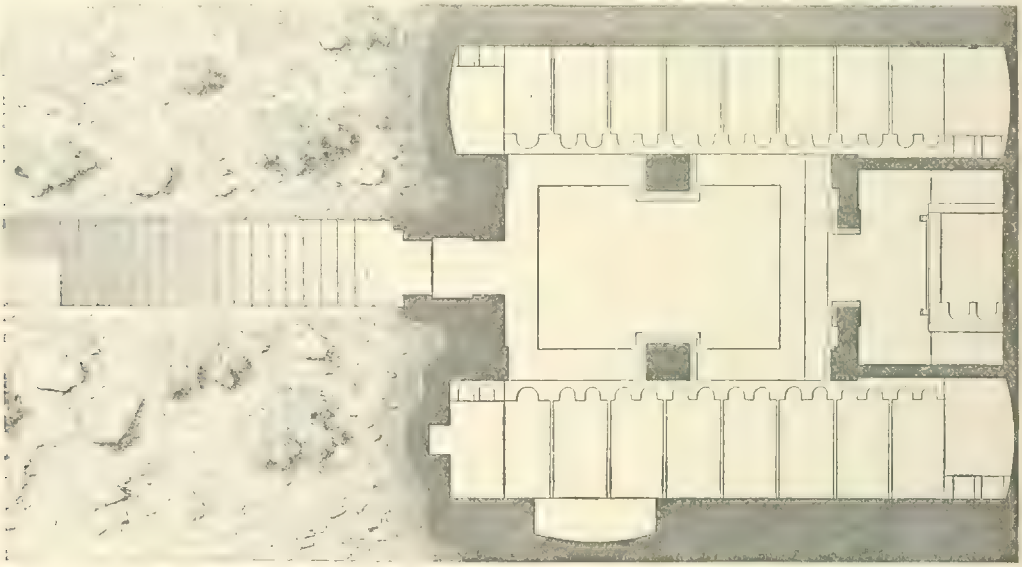
ESTUFA. (Spanish, a hothouse). A kind of hot chamber constructed by American Indians, especially by the Pueblos. It was first employed by the Spaniards of the sixteenth century and passed into common use. It has been largely superseded by the more appropriate word, *kiva*, from the language of the Moki. Not a sweat house or sweat lodge. (See Kiva.) — F. S. D.

ÉTAGE. In French, a story, as of a building; not necessarily one having a floor divided into compartments, but applied as well to one consisting merely of a row of windows, an arcade, or other separate horizontal architectural treatment. The word is rarely used in English except in connection with the special names of different stories, for which see the subtitles.

It is to be noted that in France a building is said to have only one story if it has a *premier étage* and no more stories than that above the *rez-de-chaussée*, or above the [illegible] and the *entresol*. This usage is not strange to Englishmen, whose first story is generally at least one flight of stairs from the ground floor, but it is unfamiliar to Americans, who, if untravelled, find it hard to conceive of a one-storied building as having three superimposed lines of important windows, with the most important at the top. — R. S.

Bel Étage. The principal or most important story, corresponding with the Italian *piano nobile.*

Deuxième Étage. The story above the Premier Etage.



Etruscan Tomb at Cerveteri (the Ancient Cære of the Etruscans). Plan. (See Section.)

Premier Étage. The first in order of the important stories of a building: that is to say, the story first above the *rez-de-chaussée*, or ground floor, unless there be an *entresol.* (See Étage, above.)

ETEX, ANTOINE; sculptor; b. March 20, 1808 (at Paris); d. July 14, 1888.

Etex was a pupil of Pradier and Ingres. He made the colossal groups of "War" and "Peace" on the *Arc de Triomphe de l'Étoile* (Paris).

Maurice du Seigneur in *La Grande Encyclopédie.*

ÉTIENNE; architect.

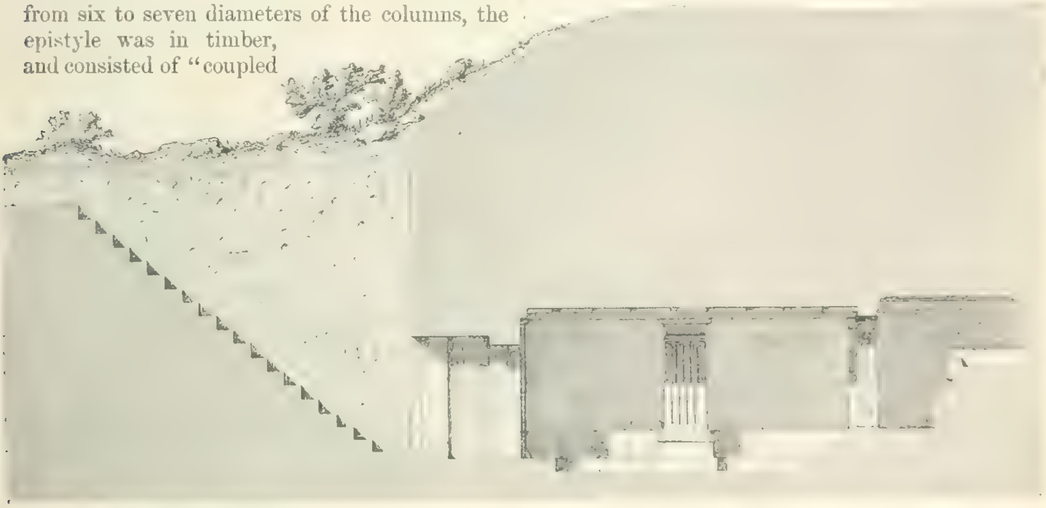
Supervising architect (*maître de l'église*) of the cathedral of Rodez (Aveyron, France), the reconstruction of which he began between 1289 and 1294.

Bauchal, *Dictionnaire.*

ETRUSCAN ARCHITECTURE. The remains of Etruscan architecture are comparatively so few that, were it not for the very important part they play in the foundation of Roman architecture, they might be passed over.

They may be divided into two classes: 1st, those which, erected in stone and of admirable construction, have in part lasted to our day; and 2d, those built in ephemeral materials which have long since passed away, and of which we are able to form conjectural restorations only, based on the writings of historians, on the large collections in various museums of the terra cotta tiles and other protective and decorative portions of the roofs, and lastly on the evidence given in the designs of their tombs, which were intended apparently to be copies of actual structures.

To the first class belong the roads, the walls of their towns, and the arched construction of the entrance gates to their towns, and of their cloacæ, or subterranean drains for the passage of water. The construction of their walls does not differ much from that found in the earlier Greek work known as Cyclopean, a similarity due more to the nature of the material at hand than to necessarily any common origin between the two peoples. This is further evidenced by the fact that both cyclopean and polygonal masonry and squared-stone masonry were employed at the same period. Where, however, a distinctively new element comes in, known to the Greeks but rarely employed by them, is in the regularly voussoired arch in stone, as found in the Cloaca Maxima at Rome and in the gates of Perugia, Falerii, Volterra, and other places. The use of the arch in crude or unburnt brick as a constructive expedient dates from time immemorial; but it is in the employment of stone and the cutting of the same to form regular voussoirs, sometimes even for skew arches as at Perugia, that the Etruscans would seem to have been the pioneers. The finest and most perfect example is that found in the Cloaca Maxima in Rome, dating from the sixth century before Christ, a barrel-vaulted sewer built to drain the Forum and other valleys. This tunnel is about 11 feet wide and from 12 to 14 feet high, the vault being formed of three concentric rings of masonry, about 2 feet 6 inches each in height, of regularly voussoired stones. Dennis refers to an earlier example on the Marta at Graviscæ, near Corneto, in which the voussoirs were 5 to 6 feet in height, showing that at a very remote date the science of arch construction was known to the Etruscans.



Etruscan Tomb at Cervetri (Ancient Cære). Longitudinal Section. (See Plan.)

Coming to the second class, we gather from meagre descriptions in Vitruvius (Chap. VII., Book 4) that the Etruscan temple had three cellas, the centre one wider than the others in the proportion of 4 to 3, and a tetrastyle portico of columns in front. As the intercolumniation was from six to seven diameters of the columns, the epistyle was in timber, and consisted of "coupled beams having a space of two inches between them, and of such height as the magnitude of the work might require." Above these and resting on either the epistyle or the wall, were the roof timbers, "distributed so that the water may drip on three sides." The ridge piece, therefore, did not run through, and the pediment existed only on the main front. There were also widely projecting eaves, equal in projection to one quarter the height of the column. Whether the mutules referred to by Vitruvius were horizontal or followed the rake of the rafters, as in Greek Doric work, is not known. The great projection of the eaves and the weight of the superincumbent gutter, antefixæ, and pendant slabs of terra cotta would seem to necessitate the existence of a tie beam. The proportions given show that the Etruscan temples, when compared with Greek and Roman examples, must have had a somewhat squat appearance; as they were, however, always built on an eminence, this would not be of much importance. Vitruvius, speaking of the mutules, says, "In front of these, members are fixed, and over these the tympanum of the pediment either of masonry or timber," and makes no mention of the terra cotta ornaments of which so many have been found, and which, by their variety and their beauty both in colour and form, give a far higher conception of the beauty of their temples than has hitherto been ascribed to them. This might have been surmised from the rich decoration found on the sarcophagi and tombs, both modelled in imitation of actual structures. The discovery in late years made in Civita Lavinia, or Lanuvium, of a large collection of terra cotta ornaments, now in the British Museum, and at Arita of the greater portion of the roof covering of a temple, now in the museum of the Villa Papa Giulio in Rome, have thrown additional light on the subject. The principal features found, and they are based on a similar design in both cases, consist of (*a*) portions of a pediment consisting of a bold cavetto moulding decorated with flutings of Egyptian character, a bead 1 inch in diameter, a fascia 5 inches in height, with a Greek fret incised and coloured on it, and a torus moulding 3 inches in diameter, the whole measuring about 18 inches in height; (*b*) a sunk gutter, with corona, similar in design and colouring to the lower portion of the pediment moulding, viz. bead, fascia, and torus moulding; (*c*) the flat tiles and the semicircular covering-joint tiles, with antefixæ of semicircular form, decorated with heads under a niche recess with fluting; and (*d*) pendant slabs about 2 feet square, the upper portion decorated as a frieze with flowing ornament, the lower portion like a pendant fringe, and decorated with ornament in relief on the front, and incised and coloured ornament on the reverse, showing that its inner face was exposed at the back. The holes in these tiles suggest that these pendant slabs were hung on the fascia board which terminated the ends of the rafters or tie beams. The soffit of the gutter shows that these slabs were set back 3 inches behind the torus moulding, and Dr. Murray of the British Museum assumes that they were hung also along the front of the temple. Unfortunately the junction at the angle of the pediment and the gutter has not been found in either example, but a winged griffin, which probably constituted the acroterium at the angle, was found at Arita. Numerous slabs from other temples are in the British Museum, and invariably the lower portion is fringed and painted at the back. These remains, and the numerous examples of rich colour decoration found in the Etruscan tombs, suggest that the Etruscan temple, in its character and colour, must have been of considerable beauty.

The Etruscan tombs were of two kinds, 1st, those consisting of immense tumuli, one of them near Chiusi being 845 feet in circumference, the chamber inside being of small dimensions, containing stone benches shaped like a bed, on which the bodies were placed and the arms and other relics of the deceased. These chambers were covered over with vaults, built in horizontal courses like the tomb of Atreus at Mycenæ. In the rock-cut tombs, where a greater width could be obtained, the ceilings were carved in imitation of the house in which the occupant lived, and it is from these we obtain an insight into their domestic architecture. The chamber represents the atrium of the Etruscan house, which corresponds to the description given in Vitruvius of the simpler type of the Roman atrium, viz. the cavædia displuviata, in which there was a comparatively small opening at the top of the roof, sloping down on all four sides. This is clearly shown in the example at Corneto, where a representation of the rafters is carved on the slope descending on all four sides. There are other tombs at Cervetri, in one a horizontal roof with rafters; in a second example the ceiling slopes on two sides, the ridge piece and rafters being carved in relief. In the third, additional support is given by square piers with volute capitals, and in the centre the opening of the atrium displuviatum. Recesses round the walls suggest the side chambers of the original house, here utilized as cubicles. In this latter well-known tomb, the walls and piers are carved with representations of the household utensils as they might have been hanging in the house. As a rule, those Etruscan tombs are decorated with friezes of figures in procession or dancing, drawn with much vigour, recalling the decoration of the Greek vases. In the Etruscan cemetery of the ancient Felsina near Bologna, the excavations undertaken since 1870 have brought to light a large number of tombstones, some upright and shaped like the Greek Ω, others spherical on a square base. The former are richly carved with ornamental borders, and vary from 3 feet 6 inches to 6 and 7 feet in height.

George Dennis, *The Cities and Cemeteries of Etruria*, 3d ed., Murray, 1883; Sir Richard F. Burton, *Etruscan Bologna*, 1876; and the collections in the British Museum, in the Papa Giulio Museum, Rome, and in the Museo Civico, Bologna, not yet illustrated or described.

— R. Phené Spiers.

EUCHARISTIC WINDOW. Same as Hagioscope; one of several names proposed in Great Britain. — (A. P. S.)

EUPALINOS; engineer.

According to Herodotus (*Historia*, III., 60), Eupalinos, son of Naustrophos, of Megara, Greece, constructed the aqueduct of Samos about 630 B.C.

Brunn, *Geschichte der Griechischen Künstler*.

EUPOLEMOS; architect.

Eupolemos built, about 420–416 B.C., the temple of Hera at Argos in place of the old building which was destroyed in 423 B.C.

Waldstein, *Excavation at Argos*.

EURIPUS. In classical archæology, a canal or ditch, especially in an amphitheatre or circus. Such ditches were used to separate the seats of the spectators from the arena, probably for safety; but they were not always present.

EUSTYLE. In classical intercolumniation, having the columns spaced in a way which was thought the most generally advantageous or effective. Hence, primarily, arranged with uniform spacing, or, as in Vitruvius, III., 2, having the columns uniformly spaced except in the middle, where a wider opening is left. In modern writing, it is generally assumed that the term signifies, so spaced that the columns shall have a clear space of 2¼ diameters between them at their base. (See Intercolumniation.)

EWERY. *A*. A room set apart for ewers and bowls; particularly, in a royal palace, a closet or napery where the ewers are filled and towels kept and attended to.

B. Anciently, the Scullery of a religious house.

EXCAVATION. The digging out or removal of earth or rock, whether for grading the surface, for cellars under buildings, or for trenches for foundations, sewers, pipes, etc. Where large quantities of material are to be excavated, powerful machinery moved by steam is employed. For ordinary operations the pick and shovel are chiefly used. Where there is room to use them, the earth is loosened with the plough and moved, if for short distances, with the horse-scoop. Soft and shelly or loose rock is excavated with pick and bar or, if too hard, is blasted with gunpowder or some form of dynamite. In the excavation of a cellar, the surface is loosened with the pick in layers over the entire surface, if the excavation is large, or a trench is excavated to the proposed depth, and the earth is undermined and detached in blocks which in falling are broken up, and can be shovelled at once into carts. For the removal of the material, an inclined roadway is left by which carts can descend to be loaded. When this is not possible, the earth is carried out in wheelbarrows, on inclined planks or skids, and emptied into a cart on top, if the place of deposit is remote. Or it may be necessary to shovel the earth into large buckets which are lifted by derricks, or the material is taken out in stages or "lifts." For this process, benches are made on the sides of the cut, the excavator throws the earth with his shovel upon the lowest bench, another workman on this bench throws it to the one above, and so on until it reaches the surface. In deep trenches of considerable extent a trenching machine is used. This consists of a long frame which is placed lengthwise over the trench and carries a hoisting engine, and near the top of the frame metal tracks, on which the material raised from the trench in large buckets is transported, either to refill the trench behind it, or to a dump, whence it can be removed if necessary in carts. In country places or in open ground, the sides of the excavation may be made with a certain slope of $\frac{1}{4}$ to $\frac{1}{2}$, depending on the material, and no other protection is needed. In city buildings it is generally necessary to support the sides, which are made vertical, with sheeting or sheet piling, consisting of planks 2 to 4 inches thick placed vertically against the bank, where they are held by one or several horizontal walings or rangers, which in turn are supported by props or shores. These extend from side to side of a narrow excavation. If the excavation is wide, the shores are inclined and abut against a pile or other support in the bottom of the excavation.

In stiff dry clay, the sides of the cutting will stand without support for a considerable depth; sand is usually without cohesion and needs support; the soft wet clays require sheet piling, which in this case may be nothing more than ordinary sheeting planks sharpened to an edge at the bottom and driven with mauls. Quicksand is sometimes so fluid that it cannot be held with sheet piling, and rises in the bottom. In some cases this has been overcome by the use of the freezing process. The ground to be excavated, and for 5 or 6 feet outside of it, is frozen by means of pipes driven into it, through which the freezing mixture circulates. When solid, it can be excavated with the pick and the masonry foundations built.

If water appears in the foundation it may be removed, if the quantity is small and unimportant, by bailing, or by steam or electric pump, or by means of an "ejector," which is a conical pipe through which a current is set up by the injection through an interior pipe of a jet of water or steam under great pressure. (For Excavation by means of caissons, see Foundation.) In the excavation of earth from foundation cylinders, a form of clamshell dredge is used, — three or four spoon-shaped cups on short stems, hinged together and spread apart, are lowered into the cylinder. The hoisting gear, being attached to the long ends of the stems, closes the cups as they are lifted filled with earth. Earth is sometimes excavated and carried away by means of a water jet, but this belongs rather to the province of the engineer than that of the architect. — W. R. HUTTON.

EXCHANGE. A public building used principally as a place of meeting for merchants or other business men (compare Bourse). The Royal Exchange in London was built in 1844, and has a well-designed Corinthian portico decorated with sculpture and a large square court surrounded by a peristyle. The Merchants' Exchange of New York was built in 1844 as a private enterprise; but the building and land was afterward sold to the government of the United States, which adapted it to the purposes of a customhouse for the port.

EXCUBITORIUM. *A.* In Roman archæology, a sleeping place or guardhouse for a post of *vigiles*, or watchmen, especially in the city of Rome.

B. An apartment for the night watchers in a mediæval monastery, whose duty it was to call the monks to their nocturnal devotions.

EXEDRA; EXHEDRA. In classical archæology, a place partly enclosed and roofed over, and provided with seats; also, a covered room or hall opening from a colonnade, and arranged as a lecture room or courtroom; an outhouse, or shed; a hall for meetings. In English usage, usually a semicircular, or nearly semicircular, raised seat, the back of which forms a low wall, and especially one of considerable size and of some pretensions. This sense is derived from the rounded apses of the Roman basilicas, which were fitted with a permanent seat, and served regularly, or on special occasions, for courtrooms. (Compare Hemicyclium.)

EXHIBITION BUILDING. In a special sense, a building erected for a temporary exhibition of considerable importance. In addition to the great international exhibitions, London 1851, New York 1853, Paris 1855, London 1863, Paris 1867, Vienna 1873, Philadelphia 1876, Paris 1878, Paris 1889, Chicago 1893, and others, there have been a great number of minor, but still very important, exhibitions to which thousands of people have thronged from many parts of the world. Each of these has involved the erection of large buildings for the Industrial Arts, for the Fine Arts, specifically so called, and for many special [illegible] ments, such as Mining, the Fisheries, Electricity, the Military and Naval resources of a government. Similar buildings have been needed for special industries, and even for private firms, who have obtained the privilege of occupying a portion of the ground, either by liberal payments or by the promise to erect decorative pavilions to be filled with interesting exhibits. The subject is, therefore, vast, and analytical treatment at present impracticable. It is to be noted, however, that many of the modern methods of building, which are so novel as to be generally disregarded by architects in the design of churches, residences, and the like, have found their best expression in these temporary structures. Thus, the Pavilion of the City of Paris of the Paris Exhibition of 1878 was an admirable structure of light ironwork with the spaces between the uprights and the horizontals filled with brickwork, and both brickwork and ironwork treated in a decorative sense; with, moreover, four great doorways of wonderfully interesting decorative composition, showing a bold and most agreeable use of unglazed tiles in relief, and enamelled tiles in brilliant colour. The larger buildings have often included applications of ironwork with glass and tile to the forms of the cupola, and the groined or cylindrical vault on a great scale, and with infinite promise of future advancement in the same direction. There have also been examples of interiors built in a purely constructive way, and according to the strictest methods of engineering science, to which beauty of form and of proportion has still been given, as in the case of the famous *Galerie des Machines* of 1889.

Much rich decoration in sculpture and in colour has also been given to some of these buildings, but this has almost entirely disappeared, only a few pieces of sculpture having been removed and preserved elsewhere. R. S.

EXHIBITION ROOM. A room for the advantageous display of objects of art, industry, or commerce. Its two most important requisites are ample lighting and space, properly disposed, on the one hand, for the cases containing the objects exhibited, and on the other, for the convenient circulation of visiting crowds. For some classes of objects overhead lighting is needed; for others, lateral lighting; while the proper arrangement of wall cases, table cases, shelves, frames, etc., must vary with every different sort of objects to be shown. (See Cabinet; Gallery; Museum.)

EXIT. A gateway or doorway intended to serve only for persons leaving a building or enclosure, especially when prepared for use when a great crowd is dispersing. In some public buildings, such as theatres, there are exits for ordinary communications and others especially prepared for use in case of alarm.

EXONARTHEX. An outer narthex, vestibule, or arcade in front of the narthex of a basilican or Byzantine church. By some writers the term is interpreted as applicable to the whole atrium, or antecourt, in front of the church; but it is more properly restricted to the outer passage of a double narthex, as in Hagia Sophia, at Constantinople. (See Narthex.)

EXPANSION. The act of growing larger and the condition of being enlarged, especially as caused under the influence of heat.

All bodies possess the property of being expanded by heat, but in different degrees. The following are the rates of linear expansion of the metals and materials in ordinary use in construction for changes of temperature from 32° to 212° Fahrenheit, or from zero to 100° Centigrade:

Brass	0.00187 to 0.00216
Bronze	0.00184
Copper	0.00170 to 0.00184
Cast Iron	0.00111
Wrought Iron and Steel	0.00110 to 0.00125
Soft Steel	0.00103
Lead	0.00290
Zinc	0.00294
Slate	0.00104
Dry timber, along the grain	0.00035 to 0.00056
Brick, common	0.00355
Brick, fire	0.0005
Cement	0.0014
Glass	0.0009
Granite	0.0008 to 0.0009
Marble	0.00065 to 0.0011
Sandstone	0.0009 to 0.0012
Terra Cotta	0.00045

Between the limits of 32° and 212° F. (0° to 100° C.) the expansion due to temperature is nearly proportional to the number of degrees; but above this the rate of expansion increases sensibly with the temperature.

Of the use of the above list the following is an example: Given a cast-iron beam 50 feet long, subjected to a rise of temperature of 80° F.; the rate of expansion for cast iron for 180° is 0.00111; and for 80° it is $\frac{0.00111 \times 80}{180^\circ} =$ 0.00049333. This, multiplied by the length of the beam, 50 feet, or 600 inches, gives 0.296 inches for the increased length of the beam due to temperature. If the variation of temperature were taken in degrees Centigrade, the number of degrees would be divided by 100° instead of 180°; otherwise, the operation would be the same. The expansion is given in the same terms as the length: feet give feet, inches give inches.

If the beam is prevented from expanding, a stress is induced equal to the pressure which would shorten the beam as much as it would be expanded by the rise in temperature, as represented by the following rule: Let a represent the rate of expansion per degree; t the number of degrees the temperature is changed; E the modulus of elasticity of the material; then $f = atE$, f being the stress per unit of section of the beam.

For steel E is 27,000,000 to 29,000,000 pounds to the square inch; therefore, for a beam 50 feet long of steel under a rise of temperature of 60° C., $f = \frac{60° \times 0.0012}{100°} \times 27{,}000{,}000$.

$\therefore f = 19{,}440$ lbs. per square inch of section.

A reduction of temperature causes contraction at the same rate as the increase of temperature causes expansion.

— W. R. HUTTON.

EXTENSION. *A.* A building added to another for the purpose of enlarging it; though this may be in a peculiar way, and have a special purpose. Thus, a conservatory may be an extension to a house which has not had such an appendage before. Hence, —

B. In local usage, probably only in the United States, a relatively small portion of a building, projecting from the main building, even if erected at the same time.

EXTENSION BAR. A removable fixture for a pair of compasses for use in describing large circles. A compass-pen or pencil being inserted in one end, the other is inserted in one leg of a pair of compasses, in place of the point.

EXTENSION BELL. (See Electrical Appliances.)

EXTRA. In building by contract, any piece of material or of work outside of the terms of the contract, and to be paid for apart. In most forms of contract it is provided that extras are to be ordered only by the superintendent. When ordered, the terms are agreed upon between the builder and the superintendent.

EXTRADOS. The external surface of the voussoirs composing an arch or vault; and hence, also, the exterior curve or boundary of the visible face of the arch. It is usually a curve concentric with that of the intrados, though not invariably so. By an erroneous usage the term is sometimes applied to the top of masonry finished to a horizontal line above an arch.

EYCKEN (EYKEN), JAN VAN DER; architect.

One of the architects employed on the great church of S. Gudule, in Brussels, Belgium. He disappears from the accounts of the building in 1494.

Kramm, *Hollandsche Kunstenaars.*

EYE. *A.* Same as Oculus.

B. One of the smaller, more or less triangular, openings between the bars of Gothic Tracery.

C. The circular, or nearly circular, central part of a volute, as in an Ionic capital.

D. In drainage and pipe laying, an opening in the side of a larger pipe for the insertion of a smaller one.

E. Rarely, same as Œil de Bœuf.

EYE BAR. A tension member of an iron or steel truss, wrought with an eye at each end, through which passes the pin forming the joint. (See Pin Joint, under Joint.)

EYEBROW. *A.* According to the *Arch. Soc. Pub. Dictionary*, "a name sometimes given to a fillet."

B. In American usage generally, a low dormer, for light or ventilation, on the slope of a roof, having no vertical sides or cheeks, the roofing being carried over it in wave line, suggesting the name.

EYE FORM. The *vesica piscis*, or "fish-bladder" outline, used in symbolical sculpture, mosaic, etc., in tracery of the late Decorated period, and in French and German flamboyant tracery.

EYELET. A small opening for light and air, or for the discharge of missiles, in the wall or parapet of a mediæval castle; usually widening toward the interior, or backed by an embrasure. The opening was usually round or square, or else extremely long and narrow; sometimes with a cross slit, or enlarged at the centre or ends by a round aperture for the discharge of firearms.

EZHUAHUAC. An Aztec penitential building.

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